A hit or a miss: The impact of unconventional monetary policy on firms in Europe

The last decade has seen one of the greatest economic experiments ever witnessed in modern history: The Unconventional Monetary Policy regime. In order to study the impact of this monetary policy regime, I have designed this study by focusing on the actions undertaken by the ECB and their impact upon the real sector. I first developed a theoretical overview of the transmission mechanism and then designed my question: Did the ECB UMP regime affect Firm Financing (non-financial) across the Eurozone? I answer the question by utilizing a panel data analysis to observe the impact of UMP measures across non -financial firms in 19 Eurozone countries. I discovered that UMP policies did impact market based firm financing, had heterogenous impact across the core and periphery countries and counterfactually firm financing would have been lower had there been no UMP measures undertaken.

Keywords: Unconventional Monetary Policy, ECB, Corporate Finance, Panel Data Methods, Quantitative Easing, Portfolio Balance Channel

By: Syed Anil Akbar (430304sa)
Supervisor: Kan Ji

ERASMUS UNIVERSITEIT ROTTERDAM
ERASMUS SCHOOL OF ECONOMICS

CONTENTS:

No.	Contents	Page
I.	Background and motivation:	3
II.	Literature Review	8
A.	Conventional Monetary Policy	
B.	Unconventional Monetary Policy	
C.	Transmission Mechanism of UMP	
D.	Corporate Finance and UMP	
E.	ECB's UMP	
III	Methodology	23
A.	My Approach	
B.	Data	
C.	Empirical Method	
IV.	Results	40
A.	Summary Statistics	
B.	Tests and Results	
V.	Conclusion	51
VI.	Bibliography	53
VII	Appendix	58
	Appendix (1) Variables Summary	
	Appendix (2) Panel Diagnostics	
	Appendix (3) QQ plots and Residuals	
	Appendix (4) Core vs GIIPS	
	Appendix (5) Bootstrapping	
	Appendix (6) Instruments Testing and Alternative Forms of Stock Issuance Specifications	

I. Background and motivation:

When penned down in history, 2008 would be mentioned not only as the year where excesses of subprime lending and Wall Street bankers wreaked havoc upon the global financial system but also as the year the global monetary policy and macroeconomics changed forever. Perhaps if summed up, the collective actions of global governments and central banks could be best described by Obert Skye's famous quote "Desperate times call for desperate measures". It was desperation which kicked into action one of the greatest not only macroeconomic but social scientific experiments of our age and one that continues until today.

However, the current Unconventional Monetary Policy (UMP) regime hardly fulfills the rigorous criteria applied within the scientific method: theory, hypothesis, experimentation, results and repetition. This is particularly as, unlike most experiments the current unconventional monetary policy actions undertaken by global monetary institutions had little ground in history or theory as the precedence of such actions is rare in history. The only parable instances were those of the US Fed and the BOJ in the 90s and early 2000s. (Ceconi etal , 2012). However, these programs were undertaken in quite different times especially since the recent unconventional measures have been carried out simultaneously by the world's biggest monetary authorities. Hence, in line with the unique nature of the current monetary experiment, there has been significant debate within popular press and international discussion fora regarding the success of such policies with proponents and opponents utilizing various measures to argue their case.

Academic scholarship, in the meantime, has tried to keep up with the pace of the popular press and public interest, in trying to come up with a scientific inquiry into the success or failure of the UMP regimes. Yet in line with the increasing public outcry over the slow economic recovery (fig.1) despite the large programs (fig 1.), further research is warranted into understanding the implications of these programs.

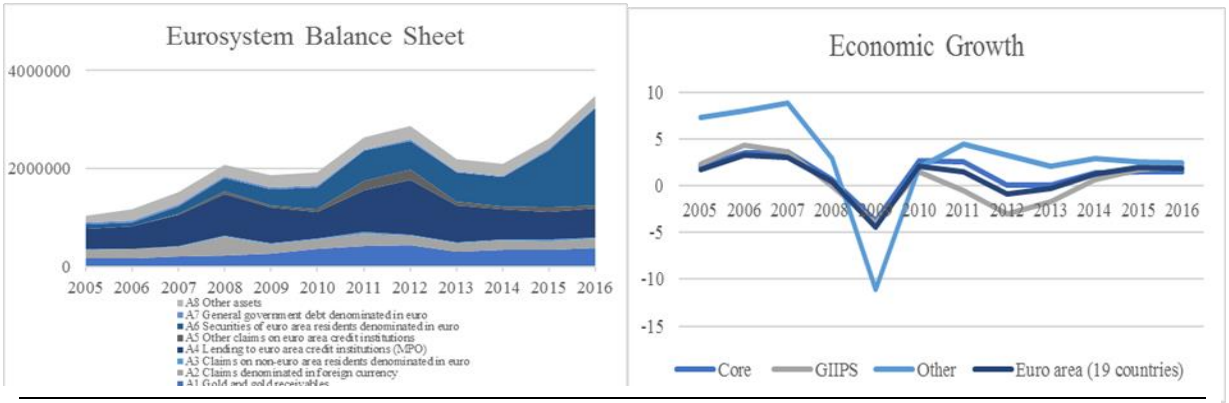


Figure: 1: Euro system Balance Sheets (LHS) and Economic Growth Rate for Eurozone (RHS) source: ECB

In order to assess the motivation behind UMP programs Ceconi etal(2012) have developed a fair response as they explain that monetary policy actions were guided more by pragmatism as the measures seem to be reasonable on the basis of the broken monetary transmission mechanism. This could be considered by the fact that during normal times the monetary policy actions are transmitted through the interbank market by Central Banks utilizing their monopolistic position on reserves. However, during a financial crisis this transmission mechanism is damaged by market events and interest rates are zero bound ensuring that the implementation of a normal monetary policy is not effective. In such times, monetary institutions rely on other than normal tools which I, taking guidance from other authors Ceconi etal (2012), Bowlder & Radia (2012) and Gagnon and Hinterschweiger (2013), describe as unconventional policy tools. The unconventional measures have so far involved measures which directly influence asset prices via either asset purchases, or measures such as forward guidance regarding short term rates, credit easing schemes or longer term refinancing operations.

Studies into the theoretical underpinnings of UMP such as those designed by Ceconi etal (2011) , Gagnon and Hinterschweiger (2013) describe the process as operating via a number of channels: (1) reducing risk spreads associated with panics (2) reducing expectations of the future short term policy interest rates, (3) reducing term premium in bond yields (4) portfolio rebalancing which operates as the demand for certain securities increases as the monetary institution enter markets (5) the signaling channel whereby communications from the central bank acts as a tool for restoring confidence in the market.

Academic literature in this field has focused on the impact of UMP measures on asset classes, bank lending and macroeconomic factors. Engen etal (2015) depicted that the unconventional monetary policy regime of the US Fed resulted in a more pronounced effect on interest rates (elsewhere), exchange rates and equity prices in the first two rounds than the later ones because the earlier programs were announced during distressed market conditions. Their results however failed to capture the effects on improvement in consumer and business confidence. Rogers etal (2014) evaluate the impact of unconventional monetary policy upon asset markets in a cross country comparison and deduce that policies ease financial conditions by reducing term premia. Wang (2014) discovered that UMPs result in reducing credit spreads by decreasing risk premium and/or liquidity premium and that they have limited effect on the bond maturities. Khosravi (2015) deduced that low interest rate environment loosens banks credit standards and encourage excessive risk taking among banks both post and pre-crisis.

However, considering the different nature of UMP measures carried out in the Eurozone, the crisis therein, and the structure of Eurozone, these studies are not as generalizable over this region as they are based on research on the UMP policies by the US Federal Researve (Fed) or Bank of England (BoE). Despite this, research upon the effects of UMP measures of the Eurozone has been fairly limited. The few studies present

within this realm have focused on specific programs. Fratzscher etal (2014) focused on LTRO (long term refinancing) and SMP (securities market programs) to display a beneficial impact on asset prices and lowering of fragmentation in the bond and equity markets. Achrya & Eisert (2016) discovered that OMT program resulted in the easing of the credit channel having no real effects within firms via the lending channel. Bernoth et.al (2014) showed that ECB's monetary policy shocks result in effects to inflation expectation, credit volume and interest rates which are not very different from those of conventional monetary policy measures. Hence this leaves room for discussion regarding ECB's UMP measures translating into visible impact onto the real economy (non-financial sector). As the real sector serves as a major source of economic activity in the Eurozne, it could serve as a good proxy towards addressing any question regarding the success or failure of the UMP regime.

Identifying this apparent gap, I have designed this study to bridge the gap between policy measures and their resultant impact upon the real (non-financial sector) by addressing the following question:

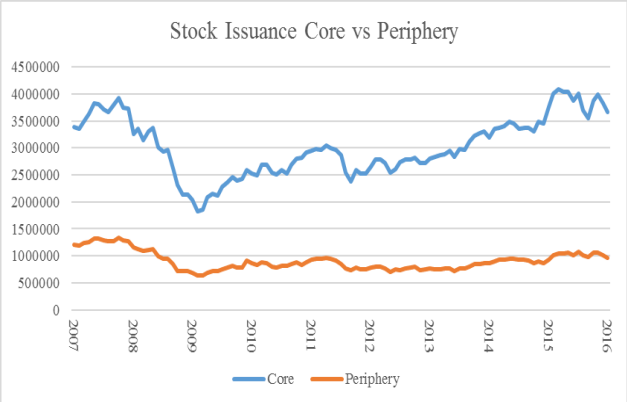
Did the ECB UMP regime affect Firm Financing (non-financial) across the Eurozone?

To address this wider question, I would be looking at two sub questions

1. Did ECB UMP measures from 2007-2016 affect corporate bond issuance (ex- financial) in the Euro 19 economies.

2. Did ECB UMP measures from 2007-2016 translate into effects upon stock issuance (ex-financial) in the Euro 19 economies.

These questions delve into three different channels of the impact of UMP measures. The first of these channels requires viewing the impact of UMP policies via the portfolio rebalancing channel as specified by Bernanke (2010). The imperfect substitutability of certain securities results in the rise of the demand for other securities. The second and third strands are credit easing and liquidity provisioning channels (which result in the transmission of UMP measures into easing liquidity conditions helping the asset markets and distressed credit channels via the provision of liquidity. Secondly these questions consider the impact upon non-financial corporates from the asset market side as opposed to Achrya etal (2016) approach towards observing the effects via the bank lending channel. This is a necessary investigation as Asset markets faced the brunt of disruption during the financial crisis and monetary policy measures can pass along their effects via them faster than bank lending channels.



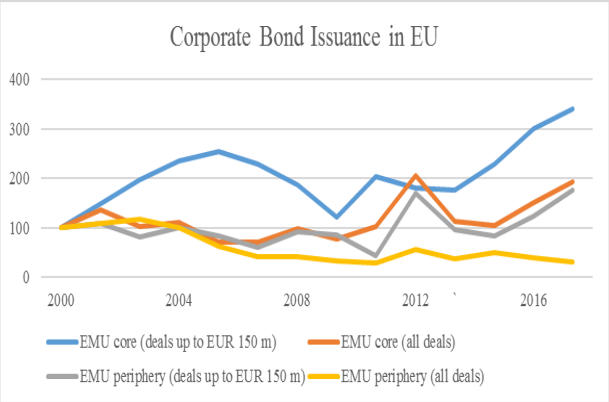


Figure: 2: Eurozone Stock Issuance in gross issues (LHS) and Eurozone bond issuance in gross issuance (RHS) source: ECB

Hence, following the large cross sectional rise in security issuance (fig2) within the Euro 19 countries during the period 2008-2016 which matches the time covering the UMP monetary policy, my approach towards understanding monetary policy implications attempts to deduce whether the UMP measures resulted in the increase in issuance across the panel of the Euro 19 countries. This in turn addresses the questions as influences from the UMP policies would, as declared by ECB, help easing the financing conditions for the firms considering the distress market period and broken credit lending channels.

In order to carry out this inquiry, I borrowed from the approach used by Lo duca etal (2013) by collecting quarterly issuance data for non-financial firms from Q12005-Q12016 of the Eurozone 19 countries and then determining the impact of issuance due to the ECB UMP measures. The reason for choosing the Eurozone 19 economies was to determine whether ECB's policies could influence financing conditions within its region of mandate and influence corporate policies within the region via its programs. Furthermore, since ECB carries out the monetary policy actions within these economies and they are not influenced by separate foreign exchange impacts or their own central bank actions, it ensures a clean representation of the impact of ECB policies into the region. To measure the UMP proxy, I use Fratzcher etal (2014)'s argument in specifying ECB's balance sheet enlargements via bond purchases and loans provided, as these are the largest components of the ECB balance sheet and were utilized while carrying forward UMP policies. The extended time series gives me a time frame (pre- and post-crisis) to observe the non-standard from standard monetary policy effects ensuring a more holistic approach.

For the empirical investigation, I divided the study into two parts the first addressing debt market financing and the second translating the effect into the equity market financing channel for non-financial corporates. The idea behind considering these two channels was to build upon the work of Achrya etal (2016) and Daetz etal (2016), who relied on the bank lending channel of the ECB measures and hence observed the

impact upon corporate lending. However, the approach, I undertook borrowed in part from Lo Duca etal (2013) and Korniyenko and Loukaianova (2015) for Bond and Stock Issuance respectively. The reason for using two different models stemmed from both theoretical and empirical concerns. Since I dealt with censored data with missing observations and a zero bound a Panel Tobit estimation was necessary for evaluation while in the equity issuance part I dealt with endogenous variables which warranted a change of methodology and the utilization of a Panel two stage least squares estimation and the adjustment of the data.

The outcome of the study gives a strong indication that non-financial corporates were affected by ECB UMP measures and that the massive programs undertaken in the Eurozone seem to result in easing financing conditions for the non-financial corporate sector. This goes to re-affirm results from Achrya etal (2016) and Daetz etal (2016) while reinforcing the methodology adopted by Lo Duca etal (2013). I discovered a strong relation, within reliable degrees of significance, between the corporate bond issuance over the period as-depicted by our model- would a rise in €1 billion in ECB measures would lead to an approximate rise of €17.6 million in corporate bond issuance. Furthermore, I discovered that there were significant differences in outcome for Core and Periphery countries and that counterfactually had there been no UMP policy measures the bond issuance would have been approximately 22% less than our predicted model and 16% less than the actual issuance that occurred. On the equity financing side, the results were also significant as the Price Book ratio instrumented by UMP policy measures showed that for every 1 unit increase in the ratio equity issuance would increase by approximately €1.6 billion in stock issuance across the panel. However, as the estimation was based on approximations we can use the results as illustrative of a relationship which merits further rigorous investigation.

Before proceeding towards the study, I would like to point out a few limitations of the study to completely delineate the research process. The first such limitation was a dearth of availability of data which coerced me into using approximate econometric techniques and aggregations hampering especially the stock issuance equations. Another limitation was the absence of raw data for Slovakia, Slovenia, Estonia, Latvia and Lithuania, prior to their integration into the Eurozone. Thus, the absence of data for these countries hamper the results and force the study to rely on a smaller sample. Lastly, there was a limitation of both resources to conduct a more thorough investigation on a micro-level (issuance level) and proxies such as index related averages had to be used for the construction of variables reducing accuracy.

Hence considering these limitations and the results, the contribution of this study to literature has been three-fold. Firstly, it has made a small addition to the literature on the impact of UMP measures upon non-financial corporates considering the entire spectrum of market based corporate finance. Hence considering the lack of empirical overview within this subject my contribution is to add to the growing yet small list of

research on the corporate financing and real effects of ECB UMP measures. Secondly, this study has demonstrated various transmission channels of UMP policies and given support to the presence of one of the hotly debated channels: portfolio balancing channel. Finally, the study has tried to add towards the popular debate regarding UMP measures by providing an academic overview.

II. Literature Review:

In order to evaluate the impact of the monetary policy programs it is imperative to understand the mechanism via conventional monetary policy works, the way unconventional monetary policy works and is different from the conventional monetary policy regime, the link between the two and corporates and its impact on asset markets. Hence to delineate this process I will go over the theoretical and empirical research done within this subject matter to develop a sound backing for my research methodology.

A. Conventional Monetary Policy:

Contemporary monetary policy is considered a rather mechanical exercise whereby the central bank uses certain rules to set the short-term nominal interest rate. The Central bank utilizes open market operations to influence interest rates and primarily decisions regarding policy committees are made on policy rates. Woodford (2003) describes this a rule setting process whereas Ceconi etal (2011) describe it as a mechanical exercise whereby the central bank uses the official interest rate and provides an adequate amount of reserves to the financial system whose distribution to the depositary institutions takes place via the interbank market. The monetary impetus hence relies on the financial markets for transmission thereby affecting credit market conditions and long term rates to influence the individual's spending and investment decisions.

B. Unconventional Monetary Policy:

In times of financial crises, such as that of 2008, conventional monetary policy faces a disconnect as Ceconi (2011), Joyce (2012) and Bowler and Radia (2012) point out that the central bank's ability to control short term rates is impaired due to the volatility of deposit demand, the financial system's inability to transfer monetary impulses and due to the zero bound on the interest rates being a limitation for monetary policy maneuvers. One cannot keep going lower as a policy response to restore the trust.

In such a situation, a central bank needs to carry out what has increasingly been called the unconventional monetary policy. Since 2008, there has been an influx of measures adopted by Central Banks in the OECD countries yet there has not been a universal definition specifying such measures. These measures typically involve the broadening of the central bank balance sheets by the loading up of assets financed by central bank money. The key feature in these programs is that unlike conventional monetary policy, a central bank tries to directly affect asset prices (something which is not specifically a part of central bank mandates globally) by varying its balance sheet. In addition, a central bank may also utilize a wide range of policy tools such as the forward guidance concerning short term interest rates, credit easing schemes and long term repo operations.

Bowler and Radia (2012) and Lenza. M etal (2010) give an overview in the broadest sense of what entails unconventional monetary policy. Both elaborate that while UMP programs differed considerably between the monetary authorities, the larger framework underpinning these programs remains the same. Unconventional monetary policy could be broken up into a conventional part and an unconventional part. The conventional part of these UMP measures involves policies whereby the monetary institution (FED, BOE, BOJ or ECB) carries forward an expansion of their balance sheets via the purchase of assets thereby injecting board money into the economy and/or it carries out Forward Guidance regarding the path interest rates are to take in the future. Thus, in doing so the central bank not only changes its balance sheet but also those of agents involved in the transactions- ie the non-bank private sector, other central banks and the banking sector. By carrying out these large scale purchases the central bank coerces a drawdown of these assets from its holders and in the meantime crediting their bank accounts (as opposed to the popular belief that it funds it by printing money). The central bank, therefore, creates broad money by increasing the deposits of the sellers of these securities (usually large financial institutions) to finance its transactions. This creates a cycle whereby the central bank's balance sheet expands because of the purchase of additional assets and matching it by reserve strengthening. The banking sector’s balance sheet expands because of increased deposits by the non-banking financial sector (funded by the central bank) matched against newly created reserves at the central bank.

The unconventional UMP policies - as recognized by Bowler & Radia (2012), Borio and Disyatat (2010) and Lenza M. etal (2010)- include measures such as liquidity operations and credit easing policies. Credit easing policies are designed to improve credit markets directly by short and long term funding to credit institutions. Such policies were carried out by monetary authorities as a supplement to their lender of the last resort function, especially by the ECB in its long-term refinancing operations and by BoE in its funding for lending scheme.

Regardless of the type of UMP measure employed, the whole process should rely on answering certain essential questions in line with the theory of modern monetary policy operations: Why does portfolio changes or signaling affect the wider economy? By what mechanism might the availability of credit to private sector is affected? How is demand influenced in these economies? Do the purchases themselves have an effect? (Joyce etal ,2012)

The answers to these questions are rather important considering that modern monetary policy operations are assumed to be neutral: meaning a credit easing or UMP purchases would be completely ineffective. Eggertsson and Wooford (2003) have explained this while building upon the earlier works of Wallace (1981) that the private sector -which has an infinite time horizon and faces no credit restrictions and works upon the assumptions of rationality- cannot see assets held by the government or the central bank as different from its own, an exchange of assets with the central bank will therefore not induce any change. However, as Joyce etal (2012) argue these assumptions are debatable considering that both the perfect substitutability between assets and the representative agent assumptions may not be appropriate for stressed financial markets. Within this regard, research by Andres etal (2004) utilizes a DSGE model with heterogeneous preferences by agents depicting that central bank purchases influenced outcomes for participants. Curdia and Wooford (2009) and (2011) have set about building upon this work by formalizing the theoretical underpinnings of the UMP regimes. Curdia and Wooford (2009) developed an extension of the New Keynesian model by loosening some of the stringent assumptions by introducing a heterogeneity in spending opportunities, incorporating multiple sources of credit spreads, allowing central bank's balance sheet to determine equilibrium and imperfect intermediation in financial markets. They discover that with such a flexible generalization via DSGE models a singular framework can be introduced to incorporate unconventional measures in the model for monetary operations.

Thus, most research has loosened the perfect substitutability assumption of assets purchased by the central bank. The reason being that for UMP to have an effect the investor needs to view both securities as imperfectly substitutable. Hence, to further understand the working of a UMP program and its wider transmission and effect onto an economy it is imperative to understand its transmission mechanism.

C. Transmission Mechanism of UMP:

I would now describe the transmission channels of UMP measures. I would first go over the transmission mechanism from UMP to Asset markets, then from Asset markets to the real economy. As elaborated by Bowler and Radia (2012), conventional UMP measures utilize three main channels: portfolio balance - which is an outcome of expansion of the central bank balance sheet and a shock to the non-bank sector's balance sheet, the signaling of future intentions regarding policy movements by central banks and asset

purchases reducing liquidity premia. This change is transmitted via asset prices into nominal spending, underscored by cost of capital and wealth effects.

(i). Asset Purchase to Asset Price

(a) Portfolio balance channel:

The so called "portfolio balance channel" is the most natural channel for the transmission of UMP into the real economy as specified by Bernanke (2009). Asset swaps, purchases and injections of liquidity directly influence the size and composition of both central banks and the private sector. These make up the portfolio balance channel. The central bank is the primary actor within this channel- by its monopolistic position on the provision of the monetary base and its ability to expand its balance sheet indefinitely- which can carry forward LSAPs (large scale asset purchases). The central bank purchases bonds (usually government bonds) from financial institutions (both bank and non-bank) leaving them holding deposits (as the central bank uses deposits to pay for the purchases). Financial institutions therefore are left holding lower yielding assets (as government bonds used in asset purchase transactions are higher yielding than money). This would result in institutional investors, which have lost a higher yielding asset, to rebalance their portfolio by going towards other assets which offer a similar yield as the one they lost to the central bank. Furthermore, since most of the institutions involved in selling the government bonds to the central bank require long dated assets to match their liabilities they are more likely to search for assets which can do so, breaking the perfect substitutability assumption. This is best described by Bernanke (2009) as he explains that asset purchases by central banks influence asset prices as investors are crowded out from certain market segments (where the purchases take place) which is why they move into other segments which remain close substitute to their earlier held assets resulting a portfolio adjustment and a string of price effects. Hence, UMP measures affect risk premia and yields of key asset classes thereby inducing investors to rebalance their portfolios.

A key assumption behind this process is the imperfect substitutability between assets. If the private sector viewed bonds and deposits as perfectly substitutable then the UMP purchases process would have no effect. When rates are zero bound short term (one period) bonds and money both have no interest, and carry a very limited credit risk. Any money created via central bank purchases of bonds would be absorbed by the private sector and would have no impact on the real economy. (Bowler and Radia, 2012)

This idea is what forms the basis of what is described as the "irrelevance proposition" of open market operations elaborated by Wallace (1981), Krugman (1998), Eggertsson and Woodford (2003). However, UMP measures carried out by ECB, FED and BOE involved longer duration assets and multiple asset classes (ie. the ECB started PSPP, corporate bond purchase program and covered bond purchase program,

the fed added government bonds and mortgage backed securities). Since yields and duration of these assets are different from money they cannot be seen as close substitutes. Hence an imperfect substitutability would induce portfolio rebalancing as explained by Tobin (1969) and Brunner and Meltzer (1972). An example would be a 10-year bund which is higher yielding than money. If an institution sells this asset to the central bank and returns money in return it cannot keep holding onto money as it needs a higher yielding asset (Aschraft, Garleanu and Pedersen 2010).

The empirical evidence of the portfolio balance channel has been hotly debated. On one hand are the proponents of the portfolio balance channel who discovered that monetary interventions or UMP measures had significant effects on bond yields. Following UMP purchases, there was a consequent decline in bond yields and rise in other asset prices which can be explained by reduction in term risk premium. This occurred due to portfolio balance effects of central bank asset purchases. (D'Amico and King, 2010, Gagnon et al ,2011, Joyce etal 2011 and Joyce etal 2012, Abbasi and Lineart 2011) All of these studies rely on an event study method in order to deduce the reduction of bond yields. A key issue within this regard is the window size used to measure market reaction, the narrower it is the more likely it is to miss the impact and the wider it is the larger there are other factors involved. Hence there is enough fodder for critique of this channel which comes from Thorton (2012) who argues that empirical measures of UMP purchases fail to provide a consistent explanation of the workings of a portfolio balance channel. He also argues that size of the purchases by central banks is quite small compared to the size of the market and that segmentation models such as those developed by Vayanos & Vila (2009) do not accurately represent the behavior of market participants such as pension funds and arbitrageurs that take duration risk in other assets such as mortgage or corporate bonds. Thus, relying on treasuries could have little effect on long term yields.

However, this critique of Thornton (2012) can be argued against using more recent research and reports from industry which show that central bank purchases have become a sizable percentage of the overall market, central banks have bought multiple asset classes and market participants have altered their portfolios during this period. Within this regard from the industry, UBS global asset management (2012) reported a 7% drop in average asset allocation to equities among UK funds in 2011 after the start of QE (UK). From the Academic side, research by Joyce etal (2015) has utilized data from insurance companies and pension funds and conducted a counterfactual analysis. They deduce that average fund allocation reduced in government bonds (gilts) and rose in corporate bonds and most funds moved out of equities. Research by Witmer J. etal (2016) focused on the US Fed's purchases and utilized mutual fund data to determine that portfolio rebalancing was driven more by long maturity and higher rating assets whereas price effects were rather small. Christensen & Krogstrup (2014) put forth a completely different reason for the portfolio balance channel which they describe as the reserve induced portfolio balance effects (as

opposed to the supply driven which we normally refer to). This channel they postulate is completely independent of assets purchased and carry out testing on the Swiss National Bank's QE program. Whereby they use dynamic term structure models observing a significant decline in bond yields driven by term premium declines (portfolio rebalancing) rather than the expected short rate drop (signaling). This they observe is a result of expansion of reserves of banks, during UMP purchases, which are swapped during the rebalancing phase for other assets.

(b). Signaling:

Another major channel for transmission of UMP policies is the signaling channel. Ceconi etal (2011) describe the signaling channel as the one activated via central bank communications to the wider the public regarding the future path of short term interest rates, the future purchases of assets purchase or other measures to correct other market dysfunctionalities. While this channel has been utilized by central banks for quite some time. Central banks have voiced their opinion regarding the macroeconomic outlook to influence rates since the 1990s. The channel could only be considered for the transmission of UMP policies only if the communication is regarding an unconventional measure. Hence, ECB, FED and BOE's forward guidance as a monetary policy tool relies on this transmission mechanism exclusively as it informs the wider public about the central bank's unconventional actions.

Research on the signaling channel dates back to Krugman (1998). He claimed that when rates are zero bound the central bank should try to convince the market that it will allow the prices to rise and increase inflationary expectations following the "irresponsibility principle". Eggertsson and Wooford (2003) built upon Krugman (1998) by using the signaling channel within their model for new Keynesian framework. They deemed this channel as forming the basis of interest rate expectations which as per the New Keynesian framework was what households and firms based their consumption, investment and borrowing decisions. Walsh (2010) further re-affirms the channel by mentioning that when central banks have superior information than market participants, the provision of this information is welfare accreting even when the path of the policy the central bank is pursuing is known by the public.

Empirically the evidence for the signaling and portfolio balance channels is largely similar. This is as researchers have pointed to the changing bond yields, due to fed announcements of purchases, as evidence for either channels. Krishnamurthy and Vissing-Jorgensen (2012) provided an extensive overview of multiple channels of transmission of US Fed UMP policies namely the signaling channel, the duration risk channel (which is a restatement of the 'preferred habitat' theory), the liquidity channel (whereby the investors or financial institutions have excess liquidity as they hold a reserves rather than less liquid bonds), safety premium (the search for safer assets), the prepayment risk premium channel (whereby risk premium

depends upon the quantity of prepayment risk borne by mortgage investors), the default risk channel (the bonds with higher default demand higher risk premium) and the inflation channel (where QE results in heightened inflation expectations). They utilize an event study methodology studying intra-day bonds price and volume data and deduce evidence for signaling as the yields on all bonds reduced while they also deduced that yields on medium and long term bonds reduced specifically due to the safety premium. Finally, they showed that inflation swaps and TIPs showed that inflation expectations were also increased within investors due to the purchases.

(c). Unconventional UMP measures and their transmission channels:

The unconventional part of UMP measures contains liquidity operations and credit easing policies which rely on the bank lending channel and credit easing channels of transmission. Liquidity operations have been an expression of the LOLR (lender of last resort function) and as Bagehot (1873) mentions are used to address liquidity shortages in troubled SIFI (systemically important financial institutions). What happens is that the central bank lends to institutions facing liquidity shortages at penal rates against quality collateral. While standing facilities, which allow a central bank to provide short term funding for institutions, are a part of conventional monetary policy regimes, During the financial crisis central banks expanded the nature of assets eligible for collateral, the rage of counterparties as well as the time for lending. Major examples of such liquidity schemes included the Fed's extension of credit to Bear Stearns, AIG and Citigroup, BOE's support for Northern Rock and ECB's LTRO (Long Term Repo Operations) programs which set the maturity of the operations at a longer duration (by revising from 12 months to 3 years) for banks in Eurozone. The reason as argued by Cour-Thimann and Winkler (2012) was to fix monetary transmission mechanism by reducing the spread between risk free and cost of capital for banks.

LTROs and other credit easing schemes have relied upon the bank lending channel which as Bernanke and Blinder (1988) explained is where the monetary policy directly impacts bank deposits which are considered a supply of loanable funds hence they translate into the driving force for bank lending. Under the force behind bank lending is policy induced quantitative changes on liability structure of bank balance sheets. This channel however was further improved upon by Diyatat (2010) who tried to reformulate the bank lending channel by describing that it works through bank's balance sheet strength and risk perception. Thus, as opposed to conventional wisdom a greater reliance on market based funding underscores the importance of the channel and bank balance sheets could act as absorbers or amplifiers of financial shocks. Empirical research upon the bank lending channel has been somewhat mixed as Buttz etal (2015) utilizing an instrumental variables approach on BOE data could not discover a bank lending channel of the BOE UMP policies which they ascribe to unstable deposits because of QE. However, several researchers could find rather small effects of the bank lending channel. (Joyce etal , 2014, Hubert etal 2013 , Achrya etal 2016)

(ii). Asset Prices to spending and economic growth.

The transmission of UMP policies explained in the last chapter are reflective of how UMP measures translate from Central bank purchases or other unconventional measures into quantitative impact upon direct asset prices (specifically bonds yields) and general credit conditions. However, to truly gauge the outcome of UMP measures it is imperative to observe their impact upon variables within the wider macro-economy. This helps us understand the area of research already addressed by literature and identify the gaps within the research which help explain our research methodology.

On the theoretical side, Bowler and Radia (2011) explain that higher asset prices (a consequence of the UMP policies) should affect the economy by reducing the cost of capital and increasing wealth. These effects should in the theoretical sense translate into improving the economic scenario; however, their effects are heterogeneous among various economic participants. Cost of capital for households and firms across the economy are related to risk free rates at a certain maturity, rates at which they are looking to borrow at. UMP measures hence do two operations to help ease credit conditions. UMP policies result in falling yield curves which affects the interest rates at which firms and households borrow and asset purchases induce the portfolio balance effect helps promote bond issuance by the banking sector if they are assumed to have the same conditions as other corporates hence boosting lending by reducing funding costs.. Wealth effects, are the second method via which UMP measures translate into the wider economy. The increase in asset prices results in increase in the wealth of capital owners. The capital gains recorded should translate into higher spending for households and firms. As for the pensions, UMP policies should be assumed as neutral due to the fall in annuity rates matching yield decreases in government bonds offset by rise in the pension pot because of the rise in the prices of the bonds held. However, as per the authors, this depends on the nature of the pension funds as underfunded defined benefit programs prior to the recession would be adversely affected as the rise in value of assets and liabilities occurred in a similar proportion resulting in increasing the deficit within these pension systems.

On the empirical side, there is ample evidence of the impact upon macro-economic variables which can be separated into two types of studies: studies on direct impact within the economies concerned and spillover effects of UMP policies. Research on the macroeconomic impact has relied on VAR, DSGE or panel estimation methodology and an extensive use of counterfactuals to deduce the nature and the size of the effects. Studies generally show that UMP measures spill over into lower private bond yields, higher equity prices, weaker exchange rates and lower foreign bond yields (Neely 2013 and Rogers etal 2014).

More recent research has also been largely complementary within this regard as federal Reserve economists Eric Engen , Thomas Laubach and Dave Reifschneider in their paper Engen etal(2015) relied on economic

survey data from the on blue chip indicators survey to infer changes in private sector perceptions of the Fed's interest rate. They utilized the FRB/US model (which is an extended version of the equilibrium model utilized by economic forecasters in the US) to observe the economic stimulus provided by UMP policies since 2009 and incorporated it within a VAR model. They discovered that the US economy suffered a simulative effect which would equal to a 1%-point cut in the federal funds (US main policy rate) over time, this also implied a reduction in the unemployment rate by more than 1% by 2014 and a boost to inflation by 0.5%.

Joyce etal (2015) followed on from their earlier study Joyce etal (2011), which depicted the QE1 policy of the UK resulting in a 1.5-1.75% impact on UK GDP, by evaluating the impact of UMP policies on the UK from QE2 and FLS program. They observed data on various macroeconomic indicators and utilized a bayesian VAR model, which they cross checked with an autoregressive distributed lag approach, and deduced that the QE2 resulted in a boost of about 0.5-0.8% of GDP and inflation increased by 0.6%.

Research on the Eurozone has remained relatively scarce across the literature. This is particularly since as noted by Peersman (2011) and Altavilla (2016) as the measures under taken in the eurozone were different from those undertaken elsewhere as they relied on focusing on the bank lending channel due to the nature of the crises in the Eurozone. They are also considered much more difficult to measure due to problems of cross country spillover effects. Peersman (2011) tried to measure the effect of UMP policies of the ECB by focusing on the earlier phase. By specifying the relatively "unconventional" nature of these policies he utilizes a structural vector autoregressive model for the euro area by looking at monthly data of economic variables such as industrial production, Loans to banks and private sector, HICP etc over 10 years (1999-2009) and identifies three sources of disturbances in the credit market (i) innovations in the credit supply independent of policy shocks (ii) credit supply shocks resulting from a shift in the ECB rate (iii) unconventional monetary policy supply shocks. He discovers a significant impact on output and inflation due to the unconventional monetary policy supply shocks which were not present using the credit innovations independent of monetary policy. However, it should be noted that Peersman focused specifically on the credit channel and not the market based channel. Altavila etal (2016) study the effects on macroeconomic variables (real GDP, Consumer prices, m3, retail credit and government bond rates) of OMT announcements by ECB by employing a flexible VAR with five lags. Furthermore, they also assess cross country effects an observe counterfactuals in the scenario. Hence they observe a no- OMT, OMT scenario and observe effects across five of the biggest countries in the Eurozone (Germany, France, Italy, Spain). They deduce that OMT announcements resulted in significant reduction in bond yields which were further associated with increase in real activity, credit and prices in Italy and Spain yet were more nuanced in Germany and France.

Hence overall research on the effects of UMP policies have shown significant impact of the policies on macroeconomic variables, credit conditions and other financial variables. While the techniques of the analysis vary considerably, one can observe the usage of panel methods and VAR methods across the literature. Furthermore, there is considerably less research on the impact of UMP policies in the Eurozone specifically as both Peersman (2011) and Altvalia (2016) because of the nature of the policies carry out in this region and the difficulty of measuring cross country effects. While this sums up the specification, transmission and translation into effects for UMP policies, there is one area namely the effects on the corporate sector or real sector where research has been relatively scarce and one which needs an in-depth assessment to fully analyze the impact of UMP policies.

D. Corporate Finance and UMP:

As mentioned earlier, one of the major points of pursuing a UMP policy was to repair the financial transmission mechanism which under the crisis had come under severe stress. Hence, to address any questions regarding the success of such a process one should determine whether the ultimate users of capital ie. firms and households faced an improvement in their financial conditions or not. While I have already developed a theoretical basis of how UMP translates from asset prices to economic growth via the cost of capital and wealth effects and how portfolio rebalancing results in increasing demand for certain securities (ie. Securities not involved in the purchases), it is also important to consider the existing literature on corporate capital policies and the monetary policy/macroeconomic environment to develop a sound basis for understanding this investigation and the channel of transmission into firm's financing.

The most well-known theories within the domain of capital structure (firm financing) decisions are the pecking order theory, the tradeoff theory, the asymmetric information theory and the market timing theory. Myers Majluf (1984) developed the pecking order theory whereby they explained that firms prefer internal to external finance, if firms had to consider external finance they would prefer debt over equity. Kraus, A and Litzenberger (1973) developed the trade - off theory wherein firms prefer a combination of debt and equity financing to balance between the advantages of debt (tax benefits of the debt tax shields, managerial disciplining and free cash flow control) and issues related to solvency and reduced pricing flexibility. The Asymmetric information theory and the market timing hypothesis (theory) go hand in hand as Baker & Wurgler (2002) explain that due to informational asymmetry and hence inefficient capital markets, managers try time issuance to take advantage of the type of issuance in consideration. They argue that when the cost of issuance is low or there are favorable market conditions or expectations of favorable market conditions are to follow, managers would try to time the market by issuing the instrument most likely to

take advantage of this. These earlier theories form the basis of any inquiry into capital structure/firm financing decisions and guide the approach taken by most authors within the field of corporate finance.

However, an important link, for this study, is between the macro-economic conditions, monetary policy and capital structure decisions. The main influence for studies between the macroeconomic conditions and capital structure decisions has been Myers and Majluf's (1984) theory of information asymmetry between firm insiders and outsiders and the signalling function of external finance whereby investors get different cues from a firm's ambition to raise external finance. Relying on these information asymmetries and Baker etals (2002) market timing hypothesis, Korajczyk and Levy (2003) were the pioneers in investigating links between macroeconomic conditions and capital structure decisions. They modeled capital structure as a function of firm and macroeconomic specific conditions and subdivided their sample into financially constrained and unconstrained firms. They discovered that unconstrained firms (firms with free access to financial markets) are influenced in their capital structure (external issuance and finance) decisions by macroeconomic conditions and tend to have a counter cyclical approach towards issuance whereas constrained firms have pro-cyclical issuance. Hackbarth Miao and Morellec (2006) took their approach one step further as they deduced the impact of macroeconomic conditions on credit risk and choice of capital structure by arguing that the default financing policy used to maximize a shareholder's value is characterized by a different threshold at each macroeconomic state and is inversely related to the macroeconomic conditions. This means that market leverage should be issued counter-cyclically in firms. Erel etal (2012) however took a different approach as they observed from a panel of debt, equity, bank loan and private placements over a period of 30 years that macroeconomic conditions influenced capital raising pro-cyclically for non-investment grade issuers while counter-cyclically for investment grade borrowers.

Academic literature has, hence, largely pointed towards a clear relation between macroeconomic environment and capital raising (firm financing) policies pursued by firms. From an anecdotal perspective since monetary policy operations are kicked in to fix the financial transmission mechanism and hence the wider macroeconomic environment. Thus, the link should be obvious yet a look over the academic literature deems such a view as rather simplistic. The earliest view on the relation between monetary policy and firm financing comes from Bernanke and Blinder (1988) and then (1999) who challenge Modgiliani Miller's irrelevance proposition by specifying that intermediate loans and open market bonds are not perfect substitutes. They also argue that the central bank must be able to change the loan supply through reserves and that an imperfect price adjustment prevents monetary policy shocks to be neutral. These assumptions alongside the portfolio rebalance view (explained earlier) formed the theoretical basis behind modern monetary policy operations and their ability to translate into real effects for firms.

On the empirical side, literature on the effects of unconventional monetary policy on firm financing has been relatively scarce. Apart from a handful of studies which have researched this topic in some form or another there have been few holistic studies of the effects of UMP measures on firm financing and hence the real economy. The major studies which I could identify were: Foley-Fisher N. etal (2014), Acharya etal (2016), Lo Duca etal (2013) and (2014). The studies hint towards possible association of a specific measure of firm financing and UMP measures adopted by central banks however the methodology and the object of interest varies between all of them.

The early studies on the effects of unconventional monetary policy on firm financing were more investigations on the spillover effects of UMP measures than actual inquiries into the impact upon the firm financing. However, these studies provided me with a strong methodology to develop tests for observing such impacts. The first of such papers are Lo Duca etal (2013) and (2014), which take the gap filling hypothesis of Greenwood etal (2010) and the portfolio balance channel of the UMP policies (explained earlier). Thhey determine that international spillover effects of the US FED and ECB policies respectively. In their first paper, Lo Duca etal (2013) consider the spillover impact of the FED quantitative easing program by observing Flow and Stock effects of UMP purchases upon bond issuance across a panel of developed and developing countries. They carry out a panel tobit estimation of issuance and proxy for UMP purchases by considering the purchases in comparison with the size of US debt and flow effects based on the change in debt securities (treasuries and mortgage backed securities). Their results showed that US Fed purchases increased corporate bond issuance across the panel but the effect was more pronounced in the emerging markets. Lo Duca (2014) was an extension of this paper as they tried to observe spillover effects of the ECB QE programs by observing the SMP program and the LTRO programs separately. They observed the impact of their primary variable of interest a dummy variable for SMP purchases and LTRO uptake by country across a panel of macroeconomic factors and corporate bond issuance. They determined that while the ECB policies resulted in affecting asset prices across the euro area and lowered market fragmentation across bond markets.

On the stock financing side, there is no paper, as far as I know, displaying the effects of UMP policies on corporate stock issuance policies. However, I can refer to Joyce etal (2015) and Daetz etal (2016) as precursors for our investigation. Joyce etal (2015) utilizing a dataset of pension fund and asset managers, holdings over the period, from the UK determined that the BoE UMP programs did not lead to a large flow of funds into equity portfolios where as it lead to a swap between sovereign and corporate bond portfolios. c by investigating of the impact of UMP purchases of the ECB upon non-financial corporates in EU countries observed a large hoarding of cash on the part of corporates which typically comes after bond issuance or stock buybacks.

E. ECB's Unconventional Policies:

ECB's UMP programs have continued from 2009 until now yet for the purposes of this research I count the period from 2009 to early 2016. While its counterparts the FED, BoE and BOJ were carrying out large scale asset purchases, ECB's UMP programs were slightly different as they were established to address the broken bank lending channel (Ceconi etal 2009). ECB started off with Long Term Refinancing operations which was aimed at improving bank lending to private sector and a limited covered bond buying program. However, with the worsening of the credit crisis and the start of the sovereign debt crisis ECb had to resort to LSAP programs and it consequently carried out limited sovereign bond buying followed by full blown bond buying and corporate sector debt purchase programs mimicking those of its counterparts.

(i) Long -term refinancing operations announcements:

Announcement date	Description of the announcement
8/12/2011	The Governing Council announced 2 three-year LTROs5
21/12/2011	Allotment of the first LTRO
29/02/2012	Allotment of the second LTRO

The Long-term refinancing operations began on the back of the fixed rate tenders and full allotment program (FRFA) to provide enhanced liquidity to the monetary lending institutions (large SIFI banks from each Eurozone country). The ECB governing council announced two liquidity providing long term refinancing operations with a 3-year maturity (January 2015 and Feburary 2015) and one year early repayment.

(ii) Target LTRO (Long Term Refinance Operations):

Announcement date	Description of the announcement
5/6/2014	The Governing Council decided to conduct a series of TLTROs.
29/07/2014	ECB publishes legal act relating to TLTRO (I)
16/09/2014	Announcement of the first TLTRO (I)
18/09/2014	The ECB allots €82.6 billion in first TLTRO
9/12/2014	Announcement of the second TLTRO (I)
11/12/2014	The ECB allots 129.8 billion in second TLTRO (I)
17/03/2015	Announcement of the third TLTRO (I)
19/03/2015	The ECB allots 97.8 billion in third TLTRO (I)
16/06/2015	Announcement of the fourth TLTRO (I)
18/06/2015	The ECB allots 73.7 billion in fourth TLTRO (I)
22/09/2015	Announcement of the fifth TLTRO (I)
24/09/2015	The ECB allots 15.5 billion in fifth TLTRO (I)
9/12/2015	Announcement of the sixth TLTRO (I)

11/12/2015	The ECB allots 18.3 billion in sixth TLTRO (I)
10/3/2016	The ECB announced new series of TLTROs (II).
22/03/2016	Announcement of the seventh TLTRO (I)
24/03/2016	The ECB allots 7.3 billion in seventh TLTRO (I)
3/5/2016	ECB publishes legal act relating to the new series of TLTROs (II)

On 5th of June ECB announced the targeted LTROs aimed at improving bank lending to nonfinancial corporations over two years. All TLTROs will mature by September 2018 and have a fixed tare over the life of the operation at the main refinancing rate and a fixed spread of 10 bps. They can be repaid after 24 months at a 6-month frequency

(iii) SMP (Securities market program):

Announcement date	Description of the announcement
9/5/2010	The ECB announced the SMP
14/05/2010	The ECB published the decision on the SMP
7/8/2011	The Governing Council decided to relaunch the SMP after a period of inactivity
6/9/2012	The SMP ended and the OMT started. Decisions on a number of technical features regarding the OMT in secondary sovereign bond markets

This program was initiated in May 2010 and ended in September 2012. The program included purchases of sovereign debt securities from troubled periphery countries to improve the transmission mechanism between Eurozone countries. The securities purchase was only carried out from countries under European Stability Mechanism (ESM) on secondary markets of 1 – 3 year maturity. The program was replaced by Outright Monetary Transmission (OMT) programs to increase the countries in the bond buying program. The OMT program came with designated rules which include ESM support, compliance, access to private lending markets, higher yields than expected.

(iv) Covered Bond Purchase Program (CBPP1, CBPP2, CBPP3)

Announcement date	Description of the announcement
7/5/2009	The ECB decided to purchase euro-denominated covered bonds issued in the euro area (CBPP1)
2/7/2009	The ECB started with the purchases of covered bonds (CBPP1)
30/06/2010	The CBPP1 ended (ECB reached the amount purchased of 60 billion)
6/10/2011	The ECB decided to start the second CBPP
3/11/2011	The ECB started with the purchases of covered bonds (CBPP2)
31/10/2012	The CBPP2 ended (ECB reached the amount purchased of 16.4 billion)

Covered bonds offer financial institution secured funding as the bonds are backed by a pool of assets (government bonds and mortgages) which offer higher yield than simple government bonds but are riskier. These were off-loaded from AM balance sheets as they were deemed risky. ECB tried to stimulate demand for these assets. The first CBPP was announced in 2009 and involved euro 60 billion in purchases. Due to the persistence of the crises this program was extended further later.

(v) Explanded asset purchase program (APP):

Announcement date	Description of the announcement
4/9/2014	The ECB announced a new CBPP (3) and a new ABSPP
20/10/2014	The ECB started to buy covered bonds (CBPP3)
21/11/2014	The ECB started the ABSPP
22/01/2015	The ECB announced the expanded asset purchase program.
9/3/2015	The ECB started to buy public sector securities under the PSPP
18/03/2015	The Governing Council decided on the criteria for which mezzanine

In order to address the persistent low inflation ECB expanded the programs into ones resembling the rest of the big three. Within this program, ECB decided to buy covered bonds as CBPP3 but also decided to purchase public sector securities in addition to private sector ones and asset backed securities. This program started in march 2015 and will continue, as per the new ecb guidance- until 2017. The purchases were fixed at euro 60 billion and now increased to EUR 80 billion a month.

(vi) CSPP (corporate sector purchase program):

Announcement date	Description of the announcement
10/3/2016	The ECB added the CSPP to the APP
21/04/2016	The ECB announced details of the CSPP
8/6/2016	The ECB started CSPP

This program was added alongside the Covered Bond and APP aims at securing investment grade euro denominated corporate debt from non-financial corporations..

(vii) Negative deposit facility:

Announcement date	Description of the announcement
5/6/2014	The Governing Council announced for the first time that the deposit facility rate would be below zero
11/6/2014	The ECB started applying the -0.10 deposit facility rate.

4/9/2014	The Governing Council set deposit facility rate even more negative (-0.20)
10/9/2014	The ECB started applying the -0.20 deposit facility rate.
3/12/2015	The Governing Council set deposit facility rate even more negative (-0.30)
9/12/2015	The ECB started applying the -0.30 deposit facility rate.
10/3/2016	The Governing Council set deposit facility rate even more negative (-0.40)
16/03/2016	The ECB started applying the -0.40 deposit facility rate.

As one of the main policy rates, ECB tries to set this rate every six weeks. The rate makes up the interest banks receive for storing money with ECB overnight. The rate was set to negative for the first time on 11th June 2014 by Eurozone governing council.

III. Methodology

A. My Approach/ Hypothesis Development:

The assessment of literature on the UMP policies gives several gaps which have yet to be fulfilled and therefore determines my motivation for this paper. Studies on the real effects upon actual users of capital as mentioned by Daetz etal (2016) have remained relatively scarce among the plethora of investigations upon asset prices, credit conditions, lending channels and macroeconomic conditions. This therefore builds the motivation for my research question.

Did the ECB UMP regime affect Firm Financing (non-financial) across the Eurozone?

This question builds upon Achrya etal (2016) and Deetz etal (2016), who studied the impact upon the effects of UMP policies of the ECB on to firms via the bank lending channel. It tries to address firm financing and effects because of UMP policies. Specifically, I will be utilizing the portfolio balance channel of Bernanke etal (1999), the gap filling hypothesis of theory of corporate debt of Greenwood etal (2002) and the market timing hypothesis of Baker etal(2002) in order to evaluate the following two questions in line with my primary questions:

(i) . ***Did ECB UMP measures from 2007-2016 affect corporate bond issuance (ex- financial) in the Euro 19 economies.***

The inquiry into this question builds up on the work by Lo Duca and Straub (2013) and Lo Duca etal (2014) who found some evidence of portfolio balancing effects and the impact upon Bond Issuance due to the US Fed Purchases. In this study, we extend the investigation upon ECB's policy and observe impact upon the bond financing within the Eurozone large corporates. The idea behind the investigation is to uncover whether there were any significant effects upon corporate bond issuance for Eurozone firms due to the UMP measures and whether these effects persisted over time and across the different regions.

a. **Impact of the UMP policies on Bond Issuance across the Eurozone:**

The idea underlying the investigation is that central bank purchases of debt securities remove certain securities from the market and/or security holders who search for other higher yielding assets thereby turning to the corporate debt markets. Corporate agents facing uncertain bank lending due to a stressed banking sector and banking institutions turning towards sovereigns would result in favorable conditions for the external debt financing markets. Furthermore, as Joyce etal (2015) display that non-bank financial institutions have been increasingly playing a role in corporate debt financing due to the re-composition of non-bank financial institution's assets (considering the changing regulation) corporate institutions have had a favorable climate for issuance of corporate debt rather than relying on stringent bank lending.

b. Periphery vs Eurozone Core:

While the Eurozone serves as a good test market due to the centralization of the monetary policy function and the harmonious nature of open market or for this matter UMP purchases, it would be limiting to disregard the disparity within the effects of UMP purchases. This comes on the back of two important factors. The corporate credit market is considerably different from the core to the periphery and therefore the translation of UMP effects should vary across the different markets since the underlying dynamics of the market make it easy or difficult to issue corporate bonds. Secondly as pointed out by Lo Duca (2013), Daetz (2016) and Agostini. G etal (2016) the ECB UMP measures were more pronounced in GIIPS particularly since these areas were involved in the ECB sovereign debt crisis which formed the motivation behind ECB's SMP program and the bulk of the LTRO uptake was also from this region. It is therefore fitting to observe the difference between the effect of ECB UMP policies between the core and the GIIPS.

c. Would issuance be as pronounced without the UMP measures?

The bulk of academic research on the impact of UMP policies have relied upon counterfactuals to distinguish whether the effects of the UMP policies are valid on their own. This is why studies such as those on spillover effects (Lo Duca etal , 2014), those on asset pricing effects (Rogers etal , 2014 , D' Amico and

King 2010) and those on macro-economic effects (Joyce etal 2012, Engen, Laubach & Reifschneider ,2015) all rely on a counterfactual analysis in order to provide a view of how the predicted effect of UMP policies would fare in a world without UMP. I would also attempt to use this analysis by holding conditions similar to those prior to the crisis in order to see the difference UMP made with regards to bond issuance.

(ii) *Did ECB UMP measures from 2007-2016 translate into effects upon stock issuance (ex-financial) in the Euro 19 economies*

The second part of my inquiry consists of an investigation into the impact of UMP policies on corporate equity issuance (non-financial). As far as I have observed from literature there are no studies, to the best of my knowledge, which have studied this topic in the current form. There are, however, multiple studies from the UMP literature and market based research which validates and supports the reasoning behind this investigation. If the theoretical channel of transmission of UMP policies is considered, portfolio balancing and signaling, one should expect the same effect observed within in corporate bond markets within the equity markets as institutions go for high yielding instruments to replace their current holdings of sovereigns and debt instruments which the ECB is buying. This would then trigger a rise in issuance in line with higher demand for such instruments. (Disyatat ,2010 ; Joyce etal 2012). This comes on back of the well-established literature on equity issuance as explained by the likes of Baker and Wurgler (2002) who first coined the market timing hypothesis and explained that high equity prices lead firms to issue equity. However, this channel is rather more complicated, as research from Dittmar and Thakor (2007) and Elliot W.B etal (2007) has argued that it is not merely stock prices that entice managers to issue equity but the perceptions about the stock price or valuations which drive equity issuance over time.

B. DATA:

In collecting Data for this study, I tried to follow Lo Duca etal (2013) and Lo Duca etal (2014) by relying upon multiple datasets to construct my sample. Since my investigation involves macro level effects I had to compile firm level issuance data for bond and debt securities, country level data on financial factors and country and cross regional factors for the macro level factors. The period in question was Q12005-Q12016 to have a significant series prior to the UMP measures and to give me a considerable time series for the investigation. The region I sampled was the EU 19 countries as the investigation concerns the impact of the Eurozone measures which were designed to rectify the broken channels of credit and economic conditions of Eurozone members. Furthermore, the region also gives a good sample to judge the conditions within a closed system where there is a single central bank and no currency effects are there to offset macro-economic conditions.

Since I did not have access to Dealogic, I had to manually collect issuance data from Thomson one and aggregate it on the country level for the Eurozone 19 economies. For each of the type of issuance: Bond and Stock, I considered non-financial firms which were listed on each of the EU 19 main stock-exchanges (Appendix1.A). To keep the comparability within the composition of my sample I had to ensure that all firms issuing stock or bonds were publicly listed on the main indices of each country. I therefore considered firms with the ISIN numbers AT00000VIE62-SK1120009230. This comes in line with Baker and Graham (2002) who display that large firms carry out bond issuance counter-cyclically and are less affected by macro-shocks as they can reach towards capital markets for firm financing. Furthermore, since only listed firms carry out equity issues (whether SEO's or IPO placement), I could not consider the non-listed firms. Out of the firms considered, I ensured that the firms carrying out the stock or bond financing had been listed on the respective stock indices for the whole period under investigation Q12005 - Q12016. Since the issues occur on a specific date, I had to aggregate issues by the quarter to make it comparable to my other variables. The preliminary statistics for the issues are presented in Appendix (1.B).

For monetary policy proxy variables (broad money: loans and debt security issued), country specific credit factors: cost of borrowing, loans to deposit ratio of countries MFI banks, GDP stock, ECB policy uncertainty index, financial transactions (net financial assets - net financial liabilities), Euribor rates and ECB refinancing rate are all collected from the ECB Statistical Database (SDW) which is calibrated on the quarterly level from the database. The industrial production, economic sentiment indicators and the foreword GDP forecasts are collected from the IMF WEO database manually and matched to each of the respective country by quarter. Finally, data on VIX and individual equity factors was collected from Bloomberg to keep consistency between the main equity indexes of the countries and their average price to book and average net debt per share ratios.

The entire database was transformed into a panel; however, what should be noted is that there was significant missing data especially for Latvia, Lithuania and Estonia. Furthermore, data was also missing for some years for Malta and Slovakia which was either not present because these countries joined the Eurozone later in the time series. This does reduce the number of observations for our study and affects its structure but it also informs the methodology we employed in this investigation which tries to address missing values in a panel database.

C. Empirical Methodology

In formulating the empirical methodology, I take guidance from the theoretical considerations specified within the literature review section, the hypothesis development outlined in the earlier section and the data

limitations specified in the previous section. As with any investigation into the effects of UMP measures, I would first specify the UMP measure which forms our primary variable of interest and then go over the empirical specifications I employed to investigate whether UMP affected bond issuance followed by an estimation of an impact upon stock issuance.

(i) The UMP variable:

The studies evaluated within the literature review chapter present a good overview of the type of proxies used within prior research for central bank actions deemed UMP. The approaches used differ based on what authors assume the definition of the unconventional monetary policy is and what transmission mechanism they employ within their investigation. Within this regard, research following Krishnamurthy and Vissing-Jorgensen (2012) has tended to employ announcements of monetary policy actions as proxies. ((D'Amico and King, 2010, Gagnon et al ,2011, Joyce etal 2011and Abbasi and Lineart 2011) This is primarily because of their event study nature. However, these are not as relevant for my investigation as my approach stems from the longer-term portfolio balance effects and the general development of macro-economic conditions rather than periodic announcement effects. Furthermore, I follow a strand of academic inquiry which investigates lower frequency data and the dependent variable in this case is influenced not by short term announcement effects but by large portfolio rebalancing effects (Bernanke etal 2009), the gap filling hypothesis of greenwood etal (2010), and the impact upon macroeconomic conditions by monetary policy measures from Bowler and Radia (2011). I have relied upon an approach towards proxying UMP variables by following Lo Duca etal (2013) and (2014), Chen etal (2011) and Tomann and Stoppel (2016) by utilizing the balance sheet approach. I have utilized two of the most important components of the Eurosystem/ECB's balance sheet:

(a) Debt securities purchased per quarter by country $QeProxy_{DebtSecByCountry}\ i,t$

(b) Loans to financial institutions per country $QeProxy_{loansByCountry}\ i,t$

as the primary independent variables within my investigation. This follows from Daetz etal (2016) who utilized a similar methodology to proxy for LTRO uptake by country and Acharya etal (2016) who followed a similar approach by keeping ECB monetary policy transmission mechanism in consideration. As explained in the earlier section ECB's UMP measures included a provision of liquidity to the banking sector via the TLTROs and later an expansion into an asset purchase program which came primarily through the NCB (national central banks).

Thus, my approach of considering these two variables from the ECB/Eurosystem's Balance sheet and accounting for the difference in the functioning of the Eurozone Monetary policy transmission mechanism ensures that country by country differences are accounted for when making the investigation. Furthermore, by considering these two aspects of the ECB/Eurosystem's balance sheets I can consider all programs carried out by the ECB and would therefore consider UMP measures rather than considering a specific program. This is particularly significant for our case since the transmission channels I specified work via the use of combined UMP policy program rather than one specific component of the program. Furthermore, corporate issuance is not influenced by one time effects by a single policy but as explained by the gap filling hypothesis (Greenwood etal 2011) and market timing hypothesis (Baker etal 2002) stem from general improvement in liquidity and the change in macroeconomic conditions which the bulk of policies were aimed towards improving.

(ii) Bond issuance Specification

(a). The model design:

In translating UMP purchases transmission into corporate bond issuance, I relied on my theoretical overview and hypothesis development. Using this and Lo Duca (2013), I developed the structure displayed below (fig.3). UMP purchases working via the various transmission channels impacted the Asset Markets and these affects translated into increased issuance via asset market affects and the effect on general economic conditions. The asset market channel accounts for the gap filling hypothesis and the fight for yields from the buyer's perspective which increase the demand for bonds and are subsequently provided by the corporates. (Greenwood etal, 2011) The change in general economic conditions induces corporates to "time the market" and take advantage of favorable issuance conditions. (Baker etal 2002)

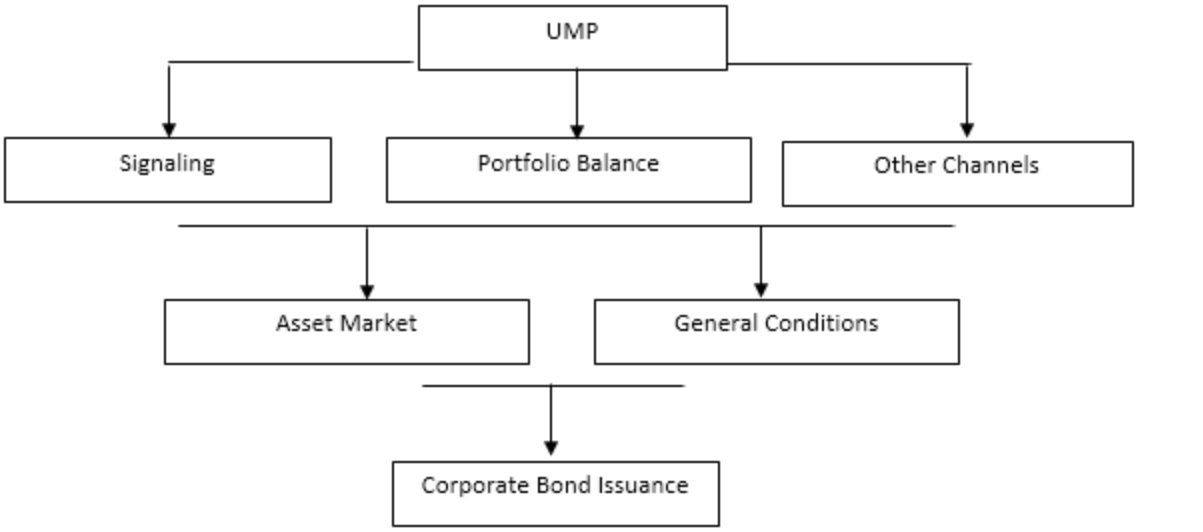


Figure: 3. Model For Bond Issuance Specification

(b). The specification design:

Considering the model displayed above and our panel of 19 Eurozone countries we relied on a panel Tobit estimation to test our hypothesis for the question of bond issuance. The motivation for using this econometric technique stems from the nature of my data and the efficiency of the process. This considering that negative issuance of bonds is not possible and issuance remains zero for some quarters for some countries where as it remains extremely high for other countries within the panel and that certain statics are not available for some countries (SVK, EST, LAT, LITH) for some years since they joined the Eurozone later. A truncated model would be best suited for this investigation. This is as the Panel Tobit model tries to correct for truncation and censoring of data. To recognize this, we need to look at the basic structure of a censored regression framework and Tobit models.

1. Censored Normal Distribution:

A censored model from the left has observations with values at or below T (tau) are set to T_y as explained bt Greene etal (2002, pg 885-901)

$$y = \begin{cases} y^* & \text{if } y^* > \tau \\ \tau_y & \text{if } y^* \leq \tau \end{cases} \qquad \text{(ai)}$$

The T and T_y are just for the purposes of generalization of having both set at zero. A continuous variable having y has a probability density function (pdf) f(y) and tau is a constant, this is the result:

$$f(y) = [f(y^t)]^{d_i}[F(\tau)]^{1-d_i} \quad \text{(aii)}$$

Which translates into the density of y being the same as the density of y* for y>T and is equal to the probability of observing y* < T if y = T, meaning a censored observation. We can hence translate from a pdf of a normal distribution to the following for the censored distribution pdf Greene etal (2002, pg 885-901):

$$P(\text{censored}) = P(y^t \leq \tau) = \Phi\left(\frac{\tau-\mu}{\sigma}\right) = 1 - \Phi\left(\frac{\mu-\tau}{\sigma}\right) \quad \text{(b.i)}$$

And

$$P(\text{uncensored}) = 1 - \Phi\left(\frac{\tau-\mu}{\sigma}\right) = \Phi\left(\frac{\mu-\tau}{\sigma}\right) \quad \text{(b.ii)}$$

Thus, the likelihood function can be written as:

$$L = \prod_i^N \left[\frac{1}{\sigma}\phi\left(\frac{y-\mu}{\sigma}\right)\right]^{d_i} \left[1 - \Phi\left(\frac{\mu-\tau}{\sigma}\right)\right]^{1-d_i} \quad \text{(c.i)}$$

2. The Tobit model:

The basic structural eqution is as follows:

$$y_{it}^* = x_{it}'\beta + a_i + \varepsilon_{it}, \quad \text{(d.i)}$$

Where y* varies over the time and cross section just like any other panel model however it in this case follows the distribution from a simulation based estimator used by Keane (1993) and McFadden (1998) whereby $a_i + \varepsilon_{it}$ are assumed to be independent over time and individuals (iid assumptions). Hence this implies (using f as the generic notion for probability mass function) that the likelihood function can be written as:

$$f(y_{i1}, \ldots, y_{iT}|x_{i1}, \ldots, x_{iT}, \beta) = \int_{-\infty}^{\infty} \prod_t f(y_{it}|x_{it}, a_i, \beta) f(a_i) da_i, \quad \text{(d.ii)}$$

Considering that f (a_i) is given by the probability density function:

$$f(a_i) = \frac{1}{\sqrt{2\pi\sigma_\alpha^2}} \exp\left\{-\frac{1}{2}\frac{a_i^2}{\sigma_\alpha^2}\right\}. \qquad \text{(d.iii)}$$

We can translate it into $f(y_{it}|x_{it}, a_i, \beta)$ and therefore write the likelihood function as:

$$f(y_{it}|x_{it}, a_i, \beta) = \frac{1}{\sqrt{2\pi\sigma_\varepsilon^2}} \exp\left\{-\frac{1}{2}\frac{(y_{it} - x_{it}'\beta - a_i)^2}{\sigma_\varepsilon^2}\right\} \quad \text{if } y_{it} > 0$$
$$= 1 - \Phi\left(\frac{x_{it}'\beta + a_i}{\sigma_\varepsilon}\right) \quad \text{if } y_{it} = 0. \qquad \text{(d.iv)}$$

Which makes the expression like the tobit models case with OLS, only difference being the inclusion of a a_i error in the conditional mean. Hence using this we can use a Tobit model to approximate a regression model for censored data which is both efficient and does away with the problems associated using OLS within such a model due to its tendency to produce biased estimates due to the censored nature of the date Greene (2002, pg 885).

(c). The Specification model:

The benchmark specification for bond issuance follows from the earlier discussion on the model design and the specification overview and is as follows:

$$Yit = \beta UMP\ i,t\ +\ \gamma 1\ Ft +\ \gamma 2\ Zi,t +\ \varepsilon\ i,t \qquad (1)$$

$$With\ UMP\ i,t =\ QeProxy_{DebtSecByCountry}\ i,t\ \ ;\ \ QeProxy_{loansBycountry}\ i,t$$

The dependent Y i,t represents the stock of bond issuance country (i) at quarter (t) in our benchmark specification. However, I change this in the robustness section to use an alternate measure of the primary dependent variable scaled by gdp of the respective countries. The UMP variables constitute two stock variables explained in the earlier section. The variable Ft represents a set of global variables which are fixed across the cross section as they represent variables which affect all countries in the panel. The variable Zit represents variables that represent domestic economic conditions which are specific for each country. While I explain these later in this section, it is important to note that these variables are created to remove the

endogeneity conditions by controlling for domestic and global factors which affect bond issuance across the panel. To estimate the model, I utilize a panel random effects tobit estimate. The reason for using a random effect results from the 'Hausman test' Hausman J. (1978) (Appendix 2.B) which shows that a fixed effects model would be inappropriate for this setting.

Later In the robustness section I use different versions of the benchmark equation by changing the independent variables. Furthermore, I conduct the estimation utilizing robust standard errors utilizing the approach of Driscoll Kraay (1998) and carry out bootstrapping with 1000 replications clustered over the 19 Eurozone countries.

Variables F_t:

I will now explain the set of my global explanatory variables which I utilized within the primary specification:

ECB Main Refinancing Rate: As the main tool for ECB's standard monetary policy operations, the main refinancing rate enables banks to acquire liquidity overnight. The refinancing operations are conducted every week. As it constitutes the main tool for ECB monetary operations and helps bank acquire liquidity this rate is a good indicator of both policy positions and liquidity provided from above (ECB website). Since the Eurosystem operates in a different way considering there are multiple NCB (national central banks) and an overarching central bank this rate serves as the equivalent of the federal funds rate in the US. The Ecb rates induce liquidity into the economy which in turn is conducive to bond issuance as explained by Korniyenko and Loukoianova (2015).

VIX: The average option implied volatility on the S&P500 index in the quarter t, as measured by the VIX index. This is a popular measure of uncertainty in the global markets (Bekaert, Hoerova and Lo Duca , 2013). While the relation of the VIX to bond issuance is not as clear cut studies such as Rey (2013) show that higher volatility triggers the move into safe heaven assets such as sovereigns. However, since the Eurozone underwent a sovereign debt crisis in 2011 and sovereign debt of GIIPs countries was no longer deemed safe haven, I include a GIIPS vs Core dummy and a separate sampling in our later estimations in order to control for this. In the robustness section, I replace this variable with ECB policy uncertainty to gauge the impact of Eurozone volatility conditions in alternate ways.

Variables Z_{it} :

These variables constitute the domestic explanatory variables which refer to individual specific conditions in each of the countries across the quarters.

Loans to deposit ratio mfis : this variable forms the first of the domestic control variables and is a proxy for judging the state of the banking institutions in the country at quarter t. Bank stress within individual economies can force corporates to seek out funding from capital markets by as loans become extremely difficult for highly leveraged banks to provide especially considering the macro-prudential supervision after the basel accords.

Cost of Borrowing: The domestic cost of borrowing constitutes an average rate of corporate lending (indexed) formed by ECB statistics to gauge the cost of credit in an economy. The long term lending rate has as documented by Baker and Wurgler (2002) an inverse relation with the bond issuance, particularly considering the market timing as high interest rates result in low issuance and low interest rates result in high lending.

Equity market performance and Volatility: The equity market volatility is taken from each country's main blue chip equity index (which includes most of the firms we considered in our bond issuance hand matching sample) and it controls for many changes in sentiments due to political events, macro and market events. As stiend (2012b) discusses firms expecting positive returns might decide to recur to the available cheap bond funding to buy back shares. In the robustness section, I remove this factor and add other economic drivers such as industrial production, economic sentiment and a hand constructed GDP forecast sample from the WEO database to make a more real time approach towards the study.

Finally, In order to control for the asset purchase programs (starting from the OMT program in 2011), I added the Asset Purchase program dummy which takes a value of 1 during the specific asset purchase programs (OMT, SMP, CBSPP , ABP).

(iii) Stock Issuance Specification:

(a). Model Design:

In our bond issuance specification, we relied on the direct channel of UMP policies into the corporate bond markets by looking at the signaling, portfolio balance and credit easing (other) channels of transmission. However, equity capital markets function in different way from debt issuance. Hence while a theoretical scenario would entail the translation of the portfolio balance and signaling channels to translate into an effect on the equity markets this is not so. A multitude of factors complicate this relation: Firstly, large institutions (which are the largest holder of corporate bonds) are bound by regulatory requirements on their equity portfolios hence they cannot just run for yields into equities. Secondly, equity raising is more costly than other types of financing for firms which is why it is the last market to tap into in the chain of financing as per the pecking order theory Myers (1984). Thirdly as Thakor (2007) and Elliot W.B etal (2007) describe

equity raises are not just a result of current stock prices but future path of prices which is based on valuations, hence temporary stock price jumps as documented by are not valid enough to motivate corporates to issue additional stock. I have had to change my approach in this section slightly. Hence the model and the question for the equity finance aspect of UMP effects on corporates is slightly different as I try to deduce whether UMP measures impacted valuations and these valuations translate into an impact on the stock issuance trends within the Eurozone nations. Thus, I adopt an approach like Korniyenko and Loukaianova (2015) who utilized a two stage least squares approach to investigate the impact of UMP measures on global liquidity conditions and security issuance. I, hence, developed the following structure following from my model above:

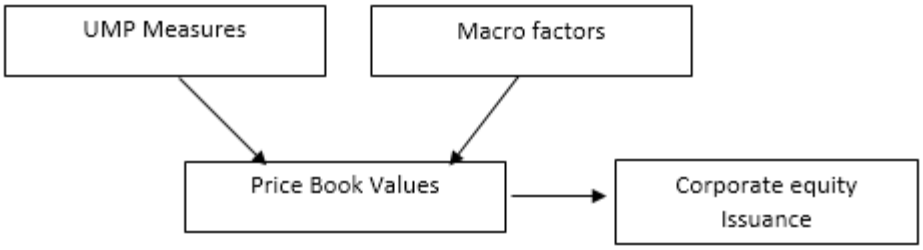


Figure: 4. Model For Stock Issuance Specification

Here I try to use a two-stage approach in order deduce the impact on our measure of valuation (Price/Book ratios) and in turn its effect on Corporate equity issuance. UMP measures by easing credit conditions and by effecting cost of capital effect valuations and these in turn influence the corporate issuance via the market timing hypothesis (Baker etal 2002) and via the depiction of future path of prices, as depicted by Thakor (2007) and Elliot W.B etal (2007), influence corporate equity financing decisions. However, in order to do so the data had to be transformed into one suitable for a panel two stage least square estimation which meant disregarding some data for which there was a dearth of availability of the variables (missing data). This affects our approximation for this question however provides a best estimate considering data constraints.

Valuation ratio (P/B) and endogeneity:

As depicted by Sharma etal (2013), price book ratio or as commonly known as Market to Book ratio has been oft used by researchers to study miss-valuations in the equity markets, in studies of inherent investment opportunities available to the firm and in studies of risk underlying equity. The reason, I incorporate this variable within the investigation is that the portfolio balance channel and signaling channel do not transform directly into the impact of equity markets. This is as central banks carry out purchases in the debt markets and not in equity markets. However, we can derive from Diyastat (2010), Joyce (2012) and Bowler &

Radia (2010) that for the portfolio balance channel to work the impact should be across asset markets and from Shiller and Belratti (1992) that bond and equity markets are inversely correlated due to the use of the common interest rate factor. Which is why the use of valuations is warranted as bond asset pricing effects translate into asset pricing and valuations on the equity side. However, the importance of the use of this variable is not only derived from the impact it has from portfolio balance and signaling channels of the UMP measures but also from its impact upon stock issuance. As well established within the theory of capital structure the market timing hypothesis of Baker & Wurgler (2002) identifies capital structure decisions to be a consequence of managers timing the market, hence in periods of low valuations stock issuance remains depressed while in periods of high valuations managers try to issue over valued equity. Thus, in this investigation looking at valuations as a surrogate for quantitative easing effects onto stock issuance is warranted by theory despite the lack of an empirical overview.

In line with this reasoning market to book ratios (price to book) ratios are endogenous within the equation as they are affected by the same macroeconomic factors as our primary dependent in this specification equity issuance. This can be considered by considering the ratio is given as below:

$$\frac{\boldsymbol{M}}{\boldsymbol{B}} = \frac{\boldsymbol{ROE} * (\boldsymbol{1} + \boldsymbol{g})}{(\boldsymbol{r} - \boldsymbol{g})}$$

This transformation is very commonly used within finance by industry and academics where the M refers to market value of the firm, B refers to book equity as written down by accounting standards, ROE is a measure of return to equity given by earnings of the underlying firm and g relates to the growth rate of the firm and r is the discount rate for the equity valuation. Sharma etal (2013) describe that the ratio is affected by both the firm specific characteristics and macro-level effects such as GDP forecasts, interest rates which makes it affected by the same conditions which UMP measures were intended on producing. I further show that not only is the M/B (P/B) ratio endogenous in theory but that an empirical model of P/B ratios under a panel random effects model under robust standard errors displays a strong correlation with each of our exploratory variables within 95% confidence (table 3).

(b). Model Specification:

To carry out this estimation, I had to change my approach from a strict tobit estimation to a panel instrumental variable regression relying on the two stage Baltagi and Chang method (2000) with Swamy Aurora standard errors owing to the design of this question, the endogeneity present between the main exploratory variable and as per Baltagi and Chang (2000) the efficiency of the method in small samples such as the one considered here. The structural form of the estimation is described below:

$$y_{it} = \mathbf{Y}_{it}\gamma + \mathbf{X}_{1it}\beta + \mu_i + \nu_{it} = \mathbf{Z}_{it}\delta + \mu_i + \nu_{it} \quad (2)$$

Where

y_{it} is the dependent variable;
$\mathbf{Y}_{it}$ is an $1 \times g_2$ vector of observations on g_2 endogenous variables included as covariates, and these variables are allowed to be correlated with the ν_{it};
$\mathbf{X}_{1it}$ is an $1 \times k_1$ vector of observations on the exogenous variables included as covariates;
$\mathbf{Z}_{it} = [\mathbf{Y}_{it}\ \mathbf{X}_{it}]$;
γ is a $g_2 \times 1$ vector of coefficients;
β is a $k_1 \times 1$ vector of coefficients; and
δ is a $K \times 1$ vector of coefficients, where $K = g_2 + k_1$.

Assuming there is 1 x k_2 vectors of observations on k_2 instruments in $\mathbf{X}_{2it}$. the order conditions would be satisfied if $k_2 > g_2$. T_i here is defined as the number of observations on the panel *i,n* to be the number of panels, and *N* as the number of observations; $N = \sum_{i=1}^{n} Ti$

The specification, as first described by Anderson and Hsiao (1982), runs with the idea that the instruments are correlated with the explanatory variables and uncorrelated with the two disturbance terms u_i and v_{it} The order conditions are specified by using the two stage least squares approach is a special version of the instrumental variables where there are two stages the first being where the estimator finds the portions of the endogenous and exogenous variables that can be attributed to the instruments (using an OLS) and the second stage involves the regression of the original equation with all of the variables replaced with the fitted values from the stage regressions. The coefficients of the regression are two stage least squares estimates. In a more formal way this is represented below as described by Biorn (2003):

$$\widehat{\beta} = \left(X'Z\,(Z'Z)^{-1}\,Z'X\right)^{-1} X'Z\,(Z'Z)^{-1}\,Z'y \quad (2.1)$$

Furthermore, since I face a small and unbalanced sample I utilize the random effects Baltagi and Chang (2000) standard errors which are as follows:

$$u = \mu_i + \nu_{it} \quad (e.i)$$

Which is the *N* x 1 vector of combined errors. Under the assumptions of the random effects model,

$$E(uu') = \sigma_\nu^2 \text{diag}\left[I_{T_i} - \frac{1}{T_i}\iota_{T_i}\iota'_{T_i}\right] + \text{diag}\left[w_i \frac{1}{T_i}\iota_{T_i}\iota'_{T_i}\right] \quad (e.ii)$$

Where

$$\omega_i = T_i\sigma_\mu^2 + \sigma_\nu^2$$

And ι_{Ti} is a vector of ones of dimension T_i. Since the variance component is unknown there is a choice between two consistent estimates to implement a feasible GLS (generalized least squares). Out of the two Baltagi and Chang (2000) approach is utilized within this estimation because of its good properties in small and unbalanced panels. Hence if we Let:

$$u_{it}^w = \widetilde{y}_{it} - \widetilde{\mathbf{Z}}_{it}\widehat{\boldsymbol{\delta}}_w \tag{e.iii}$$

And u_{it}^w is the between residual after they have passed through the between transform then:

$$\widehat{\sigma}_\nu^2 = \frac{\sum_{i=1}^{n}\sum_{t=1}^{T_i}\widetilde{u}_{it}^2}{N-n} \tag{e.iv}$$

And

$$\widehat{\sigma}_\mu^2 = \frac{\sum_{i=1}^{n}\sum_{t=1}^{T_i}\overline{u}_{it}^2 - n\widehat{\sigma}_\nu^2}{N} \tag{e.v}$$

Given the estimates of the variance components mentioned above, the feasible GLS transform of the variable ω is

$$w^* = w_{it} - \widehat{\theta}_{it}\overline{w}_{i.} \tag{e.vi}$$

Where

$$\overline{w}_{i.} = \frac{1}{T_i}\sum_{t=1}^{T_i} w_{it}$$

$$\widehat{\theta}_{it} = 1 - \left(\frac{\widehat{\sigma}_\nu^2}{\widehat{\omega}_i}\right)^{-\frac{1}{2}} \tag{e.vii}$$

And

$$\widehat{\omega}_i = T_i\widehat{\sigma}_\mu^2 + \widehat{\sigma}_\nu^2$$

Here the instruments are $\widehat{\boldsymbol{X}}it\ and\ \overline{\boldsymbol{X}}it$, $\widehat{\boldsymbol{X}}it$ is constructed by each of the variables in $\mathbf{X_{it}}$ throught the GLS transformation () and $\overline{\boldsymbol{X}}it$ is formed by the group means of the variables in $\mathbf{X_{it}}$. The estimator obtains the coefficients and its VCE from an instrumental variable regression of y^* on $\boldsymbol{Z}^*_{it}$ with instruments $\widehat{\boldsymbol{X}}it\ and\ \overline{\boldsymbol{X}}it$.

The standard deviation is calculated as:

$$\sqrt{\widehat{\sigma}_{\mu}^2 + \widehat{\sigma}_{\nu}^2}. \tag{2.2}$$

While

$$\left\{\text{corr}(\overline{\mathbf{Z}}_i\widehat{\boldsymbol{\delta}}, \overline{y}_i)\right\}^2. \tag{2.3}$$

$$\left[\text{corr}\left\{(\mathbf{Z}_{it} - \overline{\mathbf{Z}}_i)\widehat{\boldsymbol{\delta}}, y_{it} - \overline{y}_i\right\}\right]^2. \tag{2.4}$$

$$\left\{\text{corr}(\mathbf{Z}_{it}\widehat{\boldsymbol{\delta}}, y_{it})\right\}^2. \tag{2.5}$$

Are the R^2 for between, within and overall variation respectively.

(c). The Model outline:

As argued by Larcker and Rusticus (2009), utilizing panel datasets is a common place practice within Accounting and Economics research owing to the endogeneity present within the repressors utilized. However, according to them, there needs to be both an economic rationale for the use of instruments in order to make any investigation valid. Thus, having presented the rationale for my primary endogenous variable, I will now present an overview of variables utilized within the study and the other control variables within the two stage regressions as the model follows from the equation (2) from above.

Dependent:

The dependent variable in our specification is Stock Issuance in country i, and quarter t. This an aggregation of the individual equity issues over the entire quarter.

Endogenous variable:

The endogenous variable is the M/B (P/B) ratio which is an average price book ratio across all non-financial stocks in each country's main blue chip index. The theoretical overview of the choice of the variable and the endogeneity of this regressor is given in the earlier section as it informs the specification methodology.

Instruments:

The two UMP measure variables we specified in the earlier section are used as explanatory variables within this sections which are as instruments which affect the valuation variable (M/B) only via the channel displayed in the (iii)A. However for purposes of comparability, I had to linearize both the variables by the respective total debt outstanding of the respective countries.

(1) $QeProxy_{DebtSecByCountry}\ i,t$ /total debt outstanding i,t

(2) $QeProxy_{loansByCountry}\ i,t$ /total debt outstanding i,t

As the model depicts we expect an indirect effect from UMP effects on the credit markets and the lending side to translate into effects upon the equity markets as the hypothetical channel explained by Joyce etal (2012) and Bowler and Radia whereby the portfolio balance and signaling channels would produce affects across asset markets starting from the bond markets and spilling over to the equity markets.

Other instruments:

Net Debt per share: net debt per share is the calculated as the weighted average of the net debt per share across the non-financial stocks across the main equity index across country i, and quarter t. Net debt is the sum of short term and long term debt minus the cash and cash equivalents and is used by professionals to the gauge the leverage of companies. While my model uses a proxy as an indication for indebtedness within the country by index, the metric can be used for accounting for the indebtedness of the firms which influences their ability to raise equity issuance as per Myers (1984).

Return stock index: The variable is, as described in the earlier section, the weekly return compounded over the quarter in order of the main blue chip index (ex-financials) of the country in question across each quarter. This acts as a guage of current macroeconomic and industrial events in the country.

GDP Forecast: The variable is collected from WEO's economic forecasts every quarter and compiled as a foreward outlook for the country's economy. The variable controls for the medium-term outlook of the country's economy and its prospects. The forecasts influence both the valuations as explained by Sharma etal (2013) through the impact on the growth rates and stock issuance as a positive outlook creates a conducive environment for increasing capital raises.

Net Financial Transactions: The variable is a net change of financial assets vs liabilities from domestic and international agents within an economy and is a good gauge of financial market strength within an economy. The strength of capital markets is a control to account for the differences across the Eurozone economies.

IV. Results

A. Summary Statistics:

Data for the analysis sourced from the databases mentioned in the earlier chapter was used to construct a panel data set spanning 19 Countries, of which 7, (namely Austria, Belgium, Finland, France, Germany, Luxembourg and Netherlands) were further classified as "Core" and the remaining 12, (namely Cyprus, Estonia, Greece, Ireland, Italy, Latvia, Lithuania, Malta, Portugal, Spain, Slovakia and Slovenia) as "Periphery" for further stratified analysis, and 45 quarters starting from the first quarter of 2005 to the first quarter of 2016.

Descriptive statistics for Stock Issuance show that the during the entire period 2005-2016 Mean Issuance was highest for France followed by Spain, Germany, Netherlands and Austria whereas Latvia, Estonia, Lithuania and Malta had the lowest average stock issuance. This accounts for the relative differences within the openness of these markets and their size as observable from the low or negative net financial transactions proxy showing a relatively small market (appendix 1.C and D). Descriptive statistics for Bond Issuance show that mean issuance was highest for France, Germany, Italy and Netherlands whereas it was the smallest for the same countries for which mean stock issuance was the lowest again reflecting on the small size of the issuing sector. This suggests that while both stock and bond issuance was high within the core EU countries, there is variation amongst the GIIPS as Italy had significantly higher bond issuance and low stock issuance whereas Spain had higher stock issuance and lower bond issuance. (Appendix1 C and D)

This basically shows the extent of ECB programs within each of the countries. The higher representation of Periphery here is also in line with expectations as the policy was targeted at stabilizing the Periphery economies due the crisis within there as explained by Acharya etal (2016) and Daetz etal(2016). If we look at the entire panel we formulated a correlation table to observe whether our variables were correlated onto one another to spoil our estimation methodology, this can be witnessed by the table in Appendix (2.A).

Variable	Description	Mean	Std. Dev.	Min	Max
Bond Issuance	Issuance of Corporate Bonds by Quarter by Country	1,924.80	4,002.09	-	34,354.00
Stock Issuance	Issuance of Stock (Equities) by Quarter by Country	818.57	2,171.18	-	39,405.39
$QeProxy_{DebtSecByCountry}$	Explained in section.	61,494.01	118,603.20	-	838,419.00
$QeProxy_{loansByCountry\ i,t}$	Explained in section	27,455.87	45,933.89	-	306,819.00
Domestic credit/GDP	Credit to GDP ratio of the respective economy in P%	1.77	0.92	-	5.70
Loans to Deposits	Loans to Deposit Ratio is a proxy to measure the riskiness of the Lending Institutions	121.14	38.12	-	205.41
Cost of Borrowing	The average cost of borrowing for corporates	4.13	1.49	1.49	8.30
VIX	The CBOE volatility index	19.73	8.41	11.39	44.14
Stock Returns	Returns (log) for the Stock index of the main blue chip index	(0.00)	0.13	(0.64)	0.54
Euri_Bor_3	The European Interbank lending Rate	1.63	1.62	(0.23)	5.02
Net Debt Share	Average Net Debt per share across the blue chip index	6,893.09	12,533.52	(18,572.35)	73,564.03
Price to Book Ratio	Average Price to Book Ratio across the blue chip index	1.45	0.70	0.14	4.68
Volatility Indicator	ECB-Policy Uncertainty index	0.20	0.19	0.00	1.20
Financial Maturity	Net financial transactions in the economy	1,387.05	7,142.63	(51,191.00)	54,926.00

Table:1. Descriptive Statistics

B. Test and Results:

I now evaluate the impact of Unconventional Monetary Policy (UMP) on European Corporate Bond and European Corporate Stock Issuance separately to evaluate our two questions. The first part of the investigation concerned the impact of UMP purchases upon bond issuance within each of the Eurozone countries. I further explain the difference of the impact between Core and Periphery countries and then go over to complete our investigation by comparing a counterfactual scenario where UMP measures would have not occurred versus our model to see the impact of the difference. After this I extend our investigation by using our devised method to see whether UMP effects translated via the portfolio balance and signaling channel into increased issuance within equity finance.

(i). ***Did ECB UMP measures from 2007-2016 affect corporate bond issuance (ex- financial) in the Euro 19 economies.***

For the Bond Issuance analysis the dependent variable Yi,t is gross non-financial corporate bond issuance in country i at quarter t. As the dependent variable is censored (gross issuance cannot be lower than zero), the model is estimated as a panel Tobit equation. In the robustness section, I also use other econometric techniques such as the Driscoll Kraay (1998) approach to re-estimate the equation with standard errors robust to heteroscedasticity and autocorrelation and carry out bootstrapping with 1000 replications and clustering based on each of our country variables.

The explanatory variables include the two UMP variables alongside the Loans to Deposits ratio for each country, an indicator for the Cost of Borrowing in the country, the uncertainty in the stock market as captured by the CBOE VIX index, a measurement for the Stock Market Returns for each country, a measure of market volatility constructed from absolute deviations and the ECB's main refinance interest rate. Additional tests to check for the optimal model also tested for dependence on GDP Forecasts for the Eurozone, alternative measures of capturing economic uncertainty within the Eurozone such as the ECB Policy Uncertainty Indicator, Economic Sentiment Indicator for the Eurozone and Industrial Production within the Eurozone alongside Treasury Purchases made by the US Federal Reserve and the Bank of England and Assets purchased by the ECB.

To start with, I conduct a primary analysis to identify whether a panel fixed effects or random effects Tobit model should be run. In order to do this, I run both the fixed and random effects models simultaneously and run a Hausman test (1978), which allows me to decide whether the random or fixed effects model ought to be used. The Hausman test (1978) tests whether the unique errors (ui) are correlated with the regressors. The null hypothesis of the test is that they are not whereas the alternate hypothesis is that they are. Table - Appendix(3B) shows the results of the model results and the results of the Hausman (1978) test, which fail to reject the null hypothesis, thereby recommending a random effects panel model over a fixed effects panel model. Furthermore, I carry out tests to check for heteroscedasticity as well as autocorrelation in our data. The test used for for heteroscedasticity is the Baltagi & Wu (1999) approximation for the Levene Brown test which tests for heteroscedasticity in the panel data. The null of the test is that there is homoscedasticity. The rule of Thumb proposed by Baltagi & Wu (1999) states that for large samples a test statistic close to 2 or more means no heteroscedasticity. The result of this shows that our models do not suffer from a heteroscedasticity problem. Therefore, the null hypothesis of homoscedasticity (or no heteroscedasticity) is not rejected. We also conduct the Modified Bhargava et al. Durbin-Watson test by Bhargava Franzini and Narendranathan (1982) which suggests that the model does not suffer from autocorrelation. This is as the test depicts a Durbin Watson statistic greater than 1 and therefore the null of the test that there is 1st order autocorrelation is rejected. I further perform a Breusch Godfrey Lagrange Multiplier (LM) test for autocorrelation of the model which tests the null hypothesis of no autocorrelation as well as the adjusted

Breusch Pagan test to further test for heteroscedasticity within the model residuals. Both tests confirm the previous results of no significant autocorrelation within the sample within reasonable levels of significance.

a. Impact of the UMP policies on Bond Issuance across the Eurozone:

1. Main Benchmark model:

Dep Variable: Bond Issuance in MM *Explanatory Variables*	Benchmark Model	Driscoll Kraay Std Errors	Model 2	Model 3	Model 4	Model 5
$QeProxy_{DebtSecByCountry}$	0.0176***	0.00599***	0.017716***	0.020184***	.0173466***	.0176202***
$QeProxy_{loansByCountry}$ i,t	0.0044***	0.04251***	0.0043824***	0.0057394***	.0044532***	.0044688***
Loans to Deposits	7.5813*	(15.2296)***	7.392587*	6.400233	8.027076*	7.594095*
Cost of Borrowing	(146.9296)	(322.133)	(144.9383)	(266.4834)	(125.6614)	(152.2275)
VIX	(9.3592)	24.1104	(9.600704)		(9.719665)	(9.3811)
Stock Returns	809.6367	1,321.562	763.3248		852.0151	808.9706
Volatility Indicator	549.784	1476.885	525.0406		501.5635	543.7947
ECB Ref Rate	(1,788.4320) ***	(1538.893)*	(1743.424)***	(1716.44)***	(1812.686)***	(1808.608)***
GDP Forecast			(11.70439)			
ECB Policy Uncertainty				(7.55541)***		
Economic Sentiment				(21.7205)**		
Industrial Production				12.6296		
FED Treasury Purchases					0.0000425	
BOE Treasury Purchases					(0.0048841)	
Asset Purchase Prog						(25.4865)
Constant	226.2362	282.293	269.8303	2598.038*	183.1131	260.7702

Hausman Test: $\chi2(6) = 8.05$ Pr > $\chi2$ =0.2205

Modified Bhargava et al.: Durbin-Watson = 1.9487559 Baltagi-Wu LBI = 1.9637125

Breusch and Pagan Lagrangian Multiplier Test: Pr > $\chi2$ =0.0000

Pesaran's test of cross sectional independence = 10.903, Pr > $\chi2$ = 0.0000

Table2. The model is the follows from equation (1) and then applies different approximations. The left hand side gives the Explanatory variables the descriptions of which are given in the table (1). The benchmark model is Yit = UMPit + Ft + Zit +e and other equations follow the same with additional variables added to the Ft or Zit matrices. The model's diagnostics for each of the tests is given below and explained in the text. The next model uses the drescroll kraay approach in order to re-estimate the equation however the results for this model are for the purpose of an illustration of the robustness of the model. The model 2 tries to account for a more real time approach by removing stock market related indicators with GDP forecasts made in the quarter regarding following periods. The model 3 replaces VIX with ecb policy uncertainity and stock returns by eco sentiment and industrial production. The model 4 adds US and UK QE related variables to see if the impact from those programs affected European Markets. Model 5 uses an approximation of the Asset Purchase program all across the world had an impact or not. The *, ** and *** denote significance at 10%, 5% and 1% levels.

The results of the benchmark Tobit model show a positive dependence of Bond Issuance on both UMP variables as well as a positive dependence on the loans to deposits ratios, and a negative dependence on the main ECB Reference Rate. The coefficients for the effect of Loan purchase and Debt Securities purchase is small, namely every billion euros in QE related Loan Purchase led to an increase in Bond issuance by 4.4 million euros, whereas for every billion euros in QE Debt Purchase led to an increase in Bond Issuance by 17.6 million euros. These results, however, are significant at the 1 percent level. An increase in the Loans to Deposit ratio by 1 leads to a corresponding increase in Bond Issuance by a factor of 7.58, a result that is significant at the ten percent level. A negative dependence on the ECB rate, too, is in line with expectations as near zero, zero, and negative interest rates have been enacted under the UMP, leading to higher bond issuance easing credit conditions. The dependence on the interest rates is significantly larger, a decrease in rates by 1 percent, corresponds to an increase in Bond Issuance by a factor of 1788, a result that is significant at the 1 percent level. The results of the primary model can be seen in Table 1.

The model hence confirms the results from Lo Duca (2012), Joyce (2010) and Korniyenko & Loukoianova (2015) that large-scale asset purchases and additional liquidity into the credit market resulted in increasing bond issuance across the board in non-financial corporations. This goes to re-affirm Bernanke's (2009) portfolio balance channel of transmission of the UMP measures into the corporates. What it indicates is that UMP measures did indeed translate from our specified portfolio balance channels to ease financing conditions for non-financial corporates across the board.

2. Other model approximations:

I tested the model with variables that captured information like what our primary explanators captured, as well as tested with additional variables, to test if the model improved via these robustness tests. Four different altered models were tested, the results of which are displayed next to the results from the benchmark model. In the first such approximation (labelled model 2), I added the GDP forecast variable in the main specification to account for the future outlook of the economy. This was in line with Lo Duca etal (2013) as it makes the data more real time. As observable from the model the GDP outlook did not have a significant effect on the issuance of the bond and most variables stayed in line with the benchmark. Compared to our benchmark model, this increased the degrees of freedom for the model but had a higher AIC score than the benchmark model. In line with Lo Duca (2013), I replaced the VIX and the Stock Returns Indicator and replaced them with an alternative variable that captured EU Policy Uncertainty, Industrial Productivity as well as a measure for the Economic Uncertainty across the Eurozone. This made the model more reflective of the underlying conditions of the individual economies. This had a much lower AIC score than our benchmark model, suggesting that these variables ought to be preferred over our choice variables. However, the model's serial uncorrelation assumptions were affected as industrial production

across the Eurozone is heavily influenced between different regional blocks. Thus, I choose to stick with the benchmark model despite the slightly higher AIC score. I further tested two other models, one that tests for the effect of United States' Federal Reserve's Treasury Purchases and the Bank of England's Treasury Purchases as well as a final model that adds a dummy variable to account for these two countries Asset Purchase Programs. Both these models had a higher AIC score than our benchmark model and showed that when controlled for other factors as per Lo Duca etal (2013) there is not a strong relation between Asset Purchase programs in the US and UK and pronounced spillover effects in the Eurozone when accounting for Eurozone specific factors. However, the key thing to be noted is that in these models our key UMP explanators had a positive relationship with the dependent variable, and one that remained significant at the 1 and 5 percent levels.

b. Periphery vs Eurozone Core:

Model Validation Tests such as the Breusch-Pagan Lagrange multiplier test have showed that there are country specific variations within our data and both of our models. This variation is expected given that the EU is not homogenous and some countries play an outsized role compared to others, given the size of their economies. Therefore, to further investigate these variations, I conduct an inquiry into whether the difference in Bond Issuance varied between the Core EU countries, in our case Austria, Belgium, Finland, France, Germany, Luxembourg and Netherlands, and the periphery countries, namely Cyprus, Estonia, Greece, Ireland, Italy, Latvia, Lithuania, Malta, Portugal, Spain, Slovakia and Slovenia.

An initial inquiry into the relative sizes of the UMP purchases can be seen in Appendix (1.A and B). I proceed to investigate whether larger purchases within the core countries leads to greater bond issuance in the core countries. I restrict the analysis to Bond Issuance, as both stock issuance and bond issuance are correlated, and have been demonstrated to move in the same direction as well given our theoretical framework as well as our models. I use the benchmark Tobit model and use dummy variables for the Core and Periphery countries first and then follow on by dividing the data into a Core and Periphery sample.

The results, as can be seen in Table (3) show a much more pronounced effect in the Core EU countries as opposed to the Periphery countries. This suggests that, all other things being equal, the Core EU countries experienced a much larger corporate bond issuance as opposed to the periphery countries. Furthermore, the coefficients of the results remain largely similar between the dummy variable approach; However, when the separate sampling approach is applied I notice that the coefficients are much larger for Core countries on both UMP measures by a multiple of approximately 2 for the effect from asset purchases and a multiple of 5 due to lending programs. The absolute volatility coefficient despite being significant for both has opposite signs depicting the relative markets. This makes sense from an economic perspective as volatility

in equity markets in core countries results in flow of funds to bonds resulting in higher issuance where as in periphery where the markets are not as developed and corporate bonds are risky the heightened equity market volatility leads to flow of funds to the Core countries.

This result is contrary to the result of bank lending approach by Achrya etal (2016) which showed a pronounced effect of bank lending in periphery countries than in core countries. In this case the difference can be explained by the strength of the debt capital markets in core countries and the fact that sovereigns of periphery (used to benchmark for corporates) were downgraded resulting in periphery bonds losing out as investors moved out from the risky segments of these debt markets. Hence this essentially raises questions about the flow of funds from the periphery and the portfolio balance channel working against the peripheral countries. However, this investigation is beyond the scope of this study and should be addressed in follow on research.

Dependent: Bond Issuance in MM	Dummy Variable		Separate Samples	
Explanatory Variables	Core EU	Periphery	Core EU	Periphery
$QeProxy_{DebtSecByCou}$	0.0186206**	.0186206***	0.02223***	0.01209***
$QeProxy_{loansByCount}$	0.0040973**	.0040973**	0.003870*	0.00412**
Loans to Deposits	7.516792*	7.516791*	15.708	3.5853
Cost of Borrowing	(116.6636)	(116.6636)	(14.994)	(10.984)
VIX	(10.2897)	(10.2897)	(37.776)	(7.6956)
Stock Returns	838.8451	838.8452	1294.874	459.624
Volatility Indicator	528.4278	528.4278	3552.38*	(561.520)*
ECB Ref Rate	(1850.613)***	(1850.613)***	(3143.91)***	(960.063)***
Core EU	3955.224***			
Periphery		-1246.733		
Constant	(1335.869)	(2619.355)	1197.86	(458.986)

Table 3. The model here relies on equation (1) and table (2) the benchmark model and adds a dummy variable for Core EU (Austria, Belgium, Finland, France, Germany, Luxembourg and Netherlands) and Periphery (Cyprus, Estonia, Greece, Ireland, Italy, Latvia, Lithuania, Malta, Portugal, Spain, Slovakia and Slovenia). The *,**,*** denote significance at 10%, 5% and 1% levels.

c. Would the issuance be as pronounced without the UMP measures?

In order to fully capture the net effect of the Unconventional Monetary Policy on Corporate Bond and Stock Issuance, I further undertake a counterfactual analysis that shows that in the absence of UMP measures and normal interest rates across the Eurozone, corporate bond issuance would be roughly 22-23% lower than what the model predicts, and approximately 16% less than the actual bond issuance that occurred. The investigation is further carried out for Core and Periphery countries, and is found to be consistent with expectations. For the counterfactual analysis, I hold the rate of growth of UMP measures (ECB/Eurosystem balance sheet) across the 2005 to 2006 period and extrapolate it forwards and I maintain the main ECB refinance rate at its 2005 – 2006 average. These averages are maintained at the country level to account for policy and rate variations within the different countries. This eliminates the monetary interventions that the models take as explanators. The results are displayed in figure (6), where all the actual bond issuance values are plotted together with those predicted by our models as well as the counterfactual bond issuance values that our model delivers, holding everything constant and adjusting the UMP and refinancing rates.

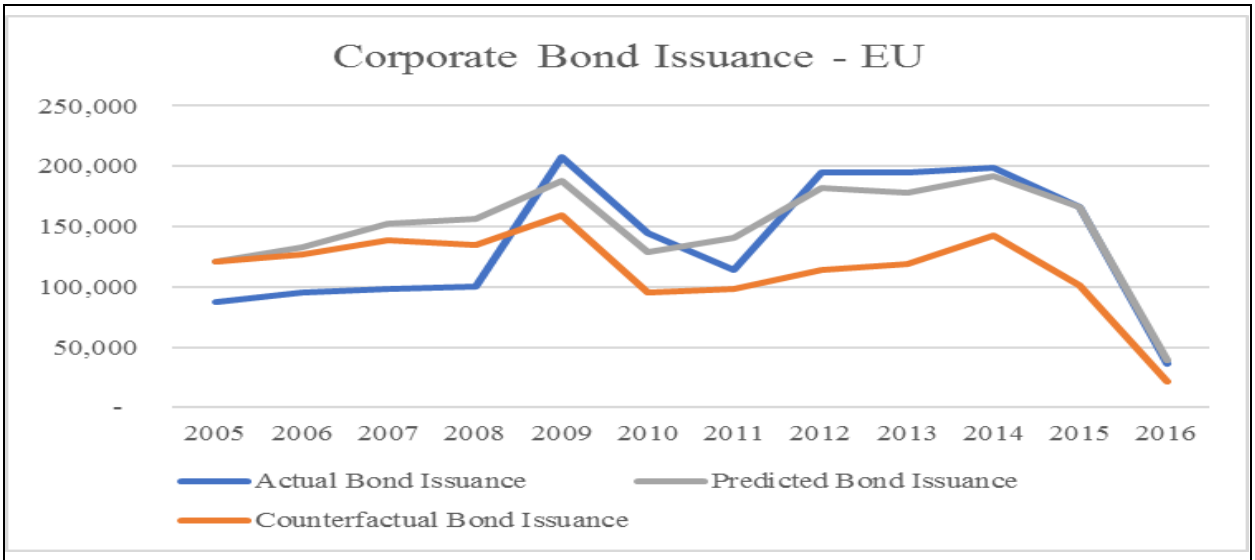


Figure 5. The model utilized in the counterfactual and predicted bonds issuance is Yit = UMPit + Fit +Zit (our benchmark equation for bond issuance). The predicted is based on the predicted results of our benchmark ran over multiple repetitions and difference samples while the counterfactual assumes that UMP variables remained fixed at their 2005-2006 average, the interest rate and loan to deposit rates also stuck to their 2005-2006 average.

The results, reaffirm the findings from Lo Duca etal (2013), Achrya etal (2016) and Daetz etal (2016) that UMP measures did contribute towards easing credit conditions across the board for the economies (especially non- financial corporates) where in the UMP policy measures were adopted. However, since the questions asked and the methodology used within all these studies varies considerably, I would recommend further research before producing conclusions regarding the impact to the non-financial sector via Corporate Credit Markets.

d. Other methods and Bootstrapping:

I undertake several other robustness to be certain of the results of our benchmark Tobit models. The Primary Tobit model is estimated with the Driscoll-Kraay (1998) fixed effect approach to account for cross sectional dependence. The results of these can be found in Table (2) above. I also tested the model with variables that captured information similar to what the primary explanators captured, as well as tested with additional variables, in order to test if the model improved whilst simultaneously carrying out a robustness test on the benchmark model. Four different altered models were tested, the results of which are displayed next to the results from our benchmark model. The alternative models added both dummy variables, as well as continuous variables that approximated the information captured by our primary regressors. The benchmark results are confirmed by all these different settings. I further test the Tobit model for robustness by bootstrapping the primary model and running 1000 boostrapping replications. Our results still hold true with the Boostrapping Standard Errors however as displayed by the robust method the significance of one of our UMP policy variables reduces as it remains significant only on the 10% level. The results are displayed in the Appendix (4 and 5).

(ii) *Did ECB UMP measures from 2007-2016 translate into effects upon stock issuance (ex-financial) in the Euro 19 economies*

Since there is a lack of theoretical overview for the investigations into the effects on the equity financing channel, I had to rely on our formulated approach based on the assessment of the literature on corporate finance, monetary policy and equity issuance provided in our previous sections. For the Stock Issuance analysis, the dependent variable was the gross stock issuance in country i at quarter t. The explanatory variables include the two UMP variables alongside the market book to price ratio for every country, the Net Debt Share for the country, an indicator for the financial maturity of the country, a measurement for the Stock Market Returns for each country and the GDP forecast for the country. The Price to Book ratio however is endogenous to Stock Issuance as the variable captures the stock price, and which in turn is affected by Stock Issuance itself. Hence, the Price to Book ratio is instrumented by UMP variables, the

GDP forecast, the financial maturity indicator and the return stock indicator in the main two stage least squares regression in order to account for any endogeneity within the model. A panel OLS regression with clustering across the 19 countries for the Price to Book ratio against the instruments shows that variation within the instrumented variable is perfectly explained by the instrumentals as all instrumentals are significant to at least the 10 percent level (most are significant at the 1 and 5 percent levels, with Debt Purchases significant at the 10 percent level). I further check whether a fixed or random effects model would be relevant by undertaking the Breusch-Pagan (1980) test. The null hypothesis in the Breusch-Pagan (1980) Lagrange multiplier test is that variances across entities, in our case countries, is zero and that there is no panel effect. The test does not fail to reject the null hypothesis, showing that there is significant difference between countries, and therefore a random effects regression is necessary in this case.

The main model is tested with Pesaran's test of cross sectional dependence to show that there is no cross-entity dependence in our model. The null hypothesis of the test is that there is no such dependence and fails to reject the null hypothesis. The model is further tested for overidentifying restrictions using the Sargan (1958)-Hansen (1982) test. The test tries to determine whether the instruments utilized in the specification are valid or not. The null hypothesis for the test is that the instruments are valid and the model is not overidentified. The instruments are valid as the null cannot be rejected at the 1%, 5% or 10% levels. Furthermore, I carry out the same tests to check for heteroscedasticity as well as autocorrelation in the Stock Issuance model that I did for our Bond Issuance Models. The test used for heteroscedasticity is the Baltagi & Wu (1999) approximation for the Levene Brown test which tests for heteroscedasticity in the panel data. The test shows that our models do not suffer from a heteroscedasticity problem. Modified Bhargava et al. Durbin-Watson test by Bhargava Franzini and Narendranathan (1982) which suggests that the model does not suffer from autocorrelation. Similarly, the Breusch Godfrey Lagrange Multiplier (LM) test confirms the same result.

Dep Variable: Stock Issuance in MM	(1)	(2)
	Random effects OLS on Price to Book Ratio (Instrumented Variable)	Two Stage Least Squares on Total Stock Issuance
Explanatory Variables	Price to Book Ratio	

$\frac{QeProxy_{DebtSecByCountry}}{Debt\_Outstanding}$	0.822611 **	
$\frac{QeProxy_{loansByCountry}}{Debt\_Outstanding}$	0.513288 *	
Price to Book Ratio		1649.8**
Net Debt Share		0.0090467
Financial Market Maturity	0.0000185***	(0.028708)
Stock Returns	1.276503***	(1102.833)
GDP Forecast	0.0926721***	(184.2481)
Constant	1.559749***	(1263.174) *

Modified Bhargava et al.: Durbin-Watson = 1.9487559 Baltagi-Wu LBI = 1.9637125

Breusch and Pagan Lagrangian Multiplier Test: Pr > $\chi 2$ =0.0000

Pesaran's test of cross sectional independence = 26.189, Pr > $\chi 2$ = 0.0000

Sargan-Hansen Test for Overidentifying Restrictions = 0.138 $\chi 2$ (1), Pr > $\chi 2$ = 0.7105

Table 4. The first model shows an approximation of the first step of the two stage regression. This is for illustrative purposes only but it shows the validity of our instruments as all are significant. The model utilizes robust standard errors which are clustered on the 19 economies and since the data for the variables utilized in it is not censored it can be used for our approximation. The second model is our results from the two stage regression which comes from the equation (2.1). The specification tests are given below the model and the *, ** and *** depict significance at 10%, 5% and 1% levels respectively.

The main model uses a two staged least squares instrumental variables regression on the panel data. The instrumented variable, Price to Book Ratio, captures the effects of the UMP variables as these variables act as instrumentals to the variable. The primary model shows a positive coefficient for the instrumented Price to Book Ratio variable, which is significant at the 10 percent level and a positive insignificant relation with GDP Forecast estimates. The captured effect on Stock Issuance is large, an observed coefficient that suggests for every point increase in the price to book ratio, Stock Issuance rises by a factor of 1649. I further carried out bootstrapping of our results with 10000 replications and country specific clusters to carry out a more robust estimation. The results there in confirm our primary model as the primary variable of interest remains significant. Appendix (6)

The assessment I carried out in this equation goes to reflect the view of Disyatat (2010), Joyce etal (2012) and Bowler and Radia (2010) that UMP measures worked via the portfolio balance and signaling channels to ease constraints on corporates and corporate finance. However, as specified before, in order to carry out

the estimation we had to rely upon a re-modification of the dataset to enable a panel instrumental variable regression or two stage least squares approximation is utilizable for the dataset. Furthermore, the primary variable of interest is a naïve average across the main blue chip indicator (ex-financials) of the country in question therefore only indicative of a relationship. Thus, the conclusion one can draw is that there is an indication of a positive relationship and one that is in line with the theoretical working of the channels UMP transmission.

V. Conclusion

When I set about writing this paper, my motivation for this study was to consider the current perspectives on UMP measures and their channels of transmission to investigate whether the measures undertaken affected the real sector (non-financial corporates). In line with my motivation, this study first developed the theoretical overview of the literature on UMP measures by going over the theoretical basis and then discussing the empirical investigations upon the subject. Utilizing the overview, I built my methodology which relied on a simple question: Did ECB monetary policy measures affect the real sector (non-financial corporations) in the Eurozone?

To answer the question, I divided the answer into two parts the first addressing debt market financing and the other addressing equity market financing channel for non-financial corporates. The idea behind considering these two channels was to build upon the work of Achrya etal (2016) and Daetz etal (2016), who relied on the bank lending channel of the ECB measures and hence observed the impact upon corporate lending. However, the approach, I undertook borrowed in part from Lo Duca etal (2013) and Korniyenko and Loukaianova (2015) for Bond and Stock Issuance respectively. The reason for using two different models stemmed from both theoretical and empirical concerns. Since I dealt with censored data with missing observations and a zero bound a tobit estimation was necessary for evaluation while in the equity issuance part I dealt with endogenous variables which warranted a change of methodology and the utilization of a two stage least squares estimation and the adjustment of the data.

The outcome of the study gives a strong indication that non-financial corporates were affected by ECB UMP measures and that the massive programs undertaken in the Eurozone seem to result in easing financing conditions for the non-financial corporate sector. This goes to re-affirm results from Achrya etal (2016) and Daetz etal (2016) while reinforcing the methodology adopted by Lo Duca etal (2013). I discovered a strong

relation, within reliable degrees of significance, between the corporate bond issuance over the period as-depicted by our model- would a rise in €1 billion in ECB measures would lead to an approximate rise of €17.6 billion in corporate bond issuance. Furthermore, I discovered that there were significant differences in outcome for Core and Periphery countries and that counterfactually had there been no UMP policy measures the bond issuance would have been approximately 22% less than our predicted model and 16% less than the actual issuance that occurred. On the equity financing side, the results were also significant as the Price Book ratio instrumented by UMP policy measures showed that for every 1 unit increase in the ratio equity issuance would increase by approximately 1.6 billion in stock issuance across the panel. However, as the estimation was based on a naïve approximation we can use the results as illustrative of a relationship which merits further investigation.

The implications of this study are numerous out of which I will elaborate a few of the most important ones. Firstly, the study further supports the portfolio balance channel and the signaling channels of UMP measures carried out by the ECB. Secondly despite the dearth of open accessible databases for stock and bond issuance, the study tries develops a methodology to investigate the casual relationship between Bond Issuance and UMP measures and tries to develop an approach for investigating the relationship between Stock Issuance and UMP measures. Thirdly, it tries to address the popular concern within both press, media and academia of the feasibility of the UMP measures by providing a small academic answer in support of the UMP measures.

However, I believe that the investigation regarding the impact and the feasibility of UMP measures especially those carried out by the ECB require a much thorough investigation and one that is beyond the scope of this study. There are several themes, I identified which could be pursued in order to develop a more holistic inquiry. These include the investigation on the firm specific level rather than the macro level of issuance (as we carried out only a macro level investigation), the further development of the channel of transmission of UMP measures into the broad range of corporate financing effects and finally the assessment of cross regional effects of the UMP measures.
Hence while it may be true that "desperate times required desperate measures" there is no doubt that academic inquiry should keep assessing whether the desperate measure utilized was effective or not in achieving the desired result.

VI. Bibliography

Abbassi, P. and Linzert, T., 2012. The effectiveness of monetary policy in steering money market rates during the financial crisis. *Journal of Macroeconomics*, *34*(4), pp.945-954.

Altavilla, C., Carboni, G. and Motto, R., 2015. Asset purchase programmes and financial markets: lessons from the euro area. *European Central Bank Working Papers November 2015*, ECB

Arellano, M. and Bond, S., 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The review of economic studies*, *58*(2), pp.277-297.

Ashcraft, A., Garleanu, N. and Pedersen, L.H., 2011. Two monetary tools: Interest rates and haircuts. *NBER Macroeconomics Annual*, *25*(1), pp.143-180.

Baltagi, B.H. and Chang, Y.-J. (2000). SIMULTANEOUS EQUATIONS WITH INCOMPLETE PANELS. *Econometric Theory*, 16(2), pp.269–279.

Baker, M. and Wurgler, J., 2002. Market timing and capital structure. *The journal of finance*, *57*(1), pp.1-32.

Bauer, M.D. and Rudebusch, G.D., 2013. The signaling channel for Federal Reserve bond purchases.

Bekaert, G., Hoerova, M. and Duca, M.L., 2013. Risk, uncertainty and monetary policy. *Journal of Monetary Economics*, *60*(7), pp.771-788.

Bernanke, B., 2009, "The Crisis and the Policy Response", *Stamp Lecture*, London School of Economics, London, England, January

Bernanke, Ben S., and Alan S. Blinder. "Credit, money, and aggregate demand." (1988).

Bernanke, B.S. and Gertler, M., 1995. *Inside the black box: the credit channel of monetary policy transmission* (No. w5146). National bureau of economic research.

Bernanke, B., Reinhart, V. and Sack, B., 2004. Monetary policy alternatives at the zero bound: An empirical assessment. *Brookings papers on economic activity*, *2004*(2), pp.1-100.

Biørn, E., Skjerpen, T. and Wangen, K.R., 2003. Parametric aggregation of random coefficient Cobb-Douglasproduction functions: evidence from manufacturing industries.

Blinder, A., Ehrmann, M., de Haan, J. and Jansen, D.J., 2008, "Central Bank Communication and Monetary Policy: A Survey of the Evidence*", Journal of Economic Literature*, XLVI(4: 910-45, December.

Borio, C. and Disyatat, P., 2010. Unconventional monetary policies: an appraisal. *The Manchester School*, *78*(s1), pp.53-89.

Bowdler, C. and Radia, A., 2012. Unconventional monetary policy: the assessment. *Oxford Review of Economic Policy*, *28*(4), pp.603-621.

Brunner, K. and Meltzer, A.H., 1972. Money, debt, and economic activity. *Journal of political Economy*, *80*(5), pp.951-977.

Cecioni, M., Ferrero, G. and Secchi, A., 2011. Unconventional monetary policy in theory and in practice.

Christensen, J.H. and Krogstrup, S., 2015. *Transmission of quantitative easing: The role of central bank reserves* (No. 2015-06). Swiss National Bank.

Christensen, J.H. and Rudebusch, G.D., 2012. The response of interest rates to US and UK quantitative easing. *The Economic Journal*, *122*(564), pp.F385-F414.

Chung, H., Laforte, J.P., Reifschneider, D. and Williams, J.C., 2012. Have we underestimated the probability of hitting the zero lower bound?. *Journal of Money, Credit and Banking*, *44*(2), pp.47-48.

Churm, R., Joyce, M., Kapetanios, G. and Theodoridis, K., 2015. Unconventional monetary policies and the macroeconomy: the impact of the United Kingdom's QE2 and Funding for Lending Scheme.

Cour-Thimann, P. and Winkler, B., 2012. The ECB's non-standard monetary policy measures: the role of institutional factors and financial structure. *Oxford Review of Economic Policy*, *28*(4), pp.765-803.

Crosignani, M. and Carpinelli, L., 2016. *The Effect of Central Bank Liquidity Injections on Bank Credit Supply*. Federal Reserve Board Working Paper.

Cúrdia, V. and Woodford, M., 2016. Credit frictions and optimal monetary policy. *Journal of Monetary Economics*, *84*, pp.30-65.

Curdia, V. and Woodford, M., 2011. The central-bank balance sheet as an instrument of monetarypolicy. *Journal of Monetary Economics*, *58*(1), pp.54-79.

D'Amico, S. and King, T.B., 2013. Flow and stock effects of large-scale treasury purchases: Evidence on the importance of local supply. *Journal of Financial Economics*, *108*(2), pp.425-448.

Dittmar, A. and Thakor, A., 2007. Why do firms issue equity?. *The Journal of Finance*, *62*(1), pp.1-54.

Dobbs, R., S. Lund, T. Koller, and A. Shwayder. 2013. "QE and ultra-low interest rates: Distributional effects and risks." McKinsey Global Institute.

Duca, M.L., Nicoletti, G. and Martinez, A.V., 2016. Global corporate bond issuance: what role for US quantitative easing?. *Journal of International Money and Finance*, *60*, pp.114-150.

Eggertsson, G. and Woodford, M., 2003, "The Zero Bound on Interest Rates and Optimal Monetary Policy", *Brookings Papers on Economic Activity*, Economic Studies Program, The Brookings Institution, 34(1): 139-235.

Elliott, W.B., Koëter-Kant, J. and Warr, R.S., 2007. A valuation-based test of market timing. *Journal of Corporate Finance*, *13*(1), pp.112-128.

Engen, E.M., Laubach, T. and Reifschneider, D., 2015. The macroeconomic effects of the Federal Reserve's unconventional monetary policies.

Erel, I., Julio, B., Kim, W. and Weisbach, M.S., 2012. Macroeconomic conditions and capital raising. *Review of Financial Studies*, *25*(2), pp.341-376.

Fawley, B.W. and Neely, C.J., 2013. Four stories of quantitative easing. *Federal Reserve Bank of St. Louis Review*, *95*(1), pp.51-88.

Fiore, F.D. and Tristani, O., 2013. Optimal monetary policy in a model of the credit channel. *The Economic Journal*, *123*(571), pp.906-931.

Foley-Fisher, N., Ramcharan, R. and Yu, E., 2016. The impact of unconventional monetary policy on firm financing constraints: evidence from the maturity extension program. *Journal of Financial Economics*, *122*(2), pp.409-429.

Fontaine, J.S., Suchanek, L. and Yang, J., 2017. Unconventional Monetary Policy: The Perspective of a Small Open Economy?. *Bank of Canada Review*, *2017*(Spring), pp.19-30.

Fratzscher, M., Lo Duca, M. and Straub, R., 2016. On the international spillovers of US quantitative easing. *The Economic Journal*.

Gagnon, J.E. and Hinterschweiger, M., 2013. Responses of Central Banks in Advanced Economies to the Global Financial Crisis. *Responding to Financial Crisis: Lessons from Asia Then, the United States and Europe Now*.

Gagnon, J., Raskin, M., Remache, J. and Sack, B., 2011. The financial market effects of the Federal Reserve's large-scale asset purchases. *international Journal of central Banking*, *7*(1), pp.3-43.

Giannone, D., Lenza, M., Pill, H. and Reichlin, L., 2011. Non-standard monetary policy measures and monetary developments.

Glick, R. and Leduc, S., 2012. Central bank announcements of asset purchases and the impact on global financial and commodity markets. *Journal of International Money and Finance*, *31*(8), pp.2078-2101.

Greene, W.H., 2003. *Econometric analysis*. Pearson Education India.

Greenwood, R. and Vayanos, D., 2014. Bond supply and excess bond returns. *Review of Financial Studies*, *27*(3), pp.663-713.

Hackbarth, D., Miao, J. and Morellec, E., 2006. Capital structure, credit risk, and macroeconomic conditions. *Journal of Financial Economics*, *82*(3), pp.519-550.

Haitsma, R., Unalmis, D. and de Haan, J., 2016. The impact of the ECB's conventional and unconventional monetary policies on stock markets. *Journal of Macroeconomics*, *48*, pp.101-116.

Hamilton, J.D. and Wu, J.C., 2012. The effectiveness of alternative monetary policy tools in a zero lower bound environment. *Journal of Money, Credit and Banking*, *44*(s1), pp.3-46.

Hausman, J. A. ,November 1978,. "Specification Tests in Econometrics". *Econometrica*. 46 (6): 1251–1271.

Joyce, M., Lasaosa, A., Stevens, I. and Tong, M., 2011. The financial market impact of quantitative easing in the United Kingdom. *International Journal of Central Banking*, *7*(3), pp.113-161.

Joyce, M.A.S., Liu, Z. and Tonks, I., 2015. 7 Institutional investor investment behaviour during the Crisis and the portfolio balance effect of QE. *Quantitative Easing*, p.63.

Kashyap, Anil K., and Jeremy C. Stein. 2012. "The Optimal Conduct of Monetary Policy with Interest on Reserves." *American Economic Journal: Macroeconomics*, 4(1): 266-82.

Keane, M 1993, "Simulation estimation for panel data models with limited dependent variables" in; G.S. Maddala, C. R. Rao and H.D. Vinod, eds , *The handbook of statistics (North Hollad, Amsterdam)* 545-572

Kishan, R.P. and Opiela, T.P., 2000. Bank size, bank capital, and the bank lending channel. *Journal of Money, Credit and Banking*, pp.121-141.

Korajczyk, R.A. and Levy, A., 2003. Capital structure choice: macroeconomic conditions and financial constraints. *Journal of financial economics*, *68*(1), pp.75-109.

Korniyenko, Y. and Loukoianova, E., 2015. The Impact of Unconventional Monetary Policy Measures by the Systemic Four on Global Liquidity and Monetary Conditions.

Kraus, A. and Litzenberger, R.H., 1973. A state-preference model of optimal financial leverage. *The journal of finance*, *28*(4), pp.911-922.

Krishnamurthy, A. and Vissing-Jorgensen, A., 2011. *The effects of quantitative easing on interest rates: channels and implications for policy* (No. w17555). National Bureau of Economic Research.

Krugman, P.R., Dominquez, K.M. and Rogoff, K., 1998. It's baaack: Japan's slump and the return of the liquidity trap. *Brookings Papers on Economic Activity*, *1998*(2), pp.137-205.

Larcker, D.F. and Rusticus, T.O., 2010. On the use of instrumental variables in accounting research. *Journal of Accounting and Economics*, *49*(3), pp.186-205.

McFadden, D., 1989. A method of simulated moments for estimation of discrete response models without numerical integration. *Econometrica: Journal of the Econometric Society*, pp.995-1026.

Middeldorp, Menno. 2015. Very Much Anticipated: ECB QE Had a Big Impact on Asset Prices, Even before It Was Officially Announced. Bank Underground (August 14). London: Bank of England.

Middeldorp, Menno, and Oliver Wood. 2016. Too Eagerly Anticipated: The Impact of the Extension of ECB QE on Asset Prices. Bank Underground (March 4). London: Bank of England.

Modigliani, F. and Sutch, R., 1966. Innovations in interest rate policy. *The American Economic Review*, *56*(1/2), pp.178-197.

Myers, S.C. and Majluf, N.S., 1984. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of financial economics*, *13*(2), pp.187-221.

Neely, C.J., 2010. *The large scale asset purchases had large international effects* (pp. 1-45). Federal Reserve Bank of St. Louis, Research Division.

Neely, C.J., 2014. How Persistent Are Unconventional Monetary Policy Effects?. *Federal Reserve Bank of St. Louis Working Paper Series*, (2014-004).

Peersman, G., 2011. Macroeconomic effects of unconventional monetary policy in the euro area. *IMF working papers November 2011*, IMF

Rey, H., 2015. *Dilemma not trilemma: the global financial cycle and monetary policy independence* (No. w21162). National Bureau of Economic Research.

Rogers, J.H., Scotti, C. and Wright, J.H., 2014. Evaluating asset-market effects of unconventional monetary policy: a multi-country review. *Economic Policy*, *29*(80), pp.749-799.

Sharma, A., Branch, B., Chgawla, C. and Qiu, L., 2013. Explaining Market-to-Book: The relative impact of firm performance, growth, and risk. *Business Quest*.

Shiller, R.J. and Beltratti, A.E., 1992. Stock prices and bond yields: Can their comovements be explained in terms of present value models?. *Journal of Monetary Economics*, *30*(1), pp.25-46.

Swanson, E.T., 2011. Let's twist again: a high-frequency event-study analysis of operation twist and its implications for QE2. *Brookings Papers on Economic Activity*, *2011*(1), pp.151-188.

Thornton, D., 2010, "The Effectiveness of Unconventional Monetary Policy: The Term Auction Facility", Federal Reserve Bank of St. Louis, Working Paper Series no. 2010-044A, October.

Tobin, J., 1969. A general equilibrium approach to monetary theory. *Journal of money, credit and banking*, *1*(1), pp.15-29.

Tomann, H. and Stöppel, A., 2016. The ECB's Unconventional Monetary Policy. *online source: europawissenschaften-berlin. de/media/pdf/Publikationen*.

UBS Global Asset Management ,2012. Pension Fund Indicators Report for 2012, UBS Global Asset Management.

Vayanos, D. and Vila, J.L., 2009. *A preferred-habitat model of the term structure of interest rates* (No. w15487). National Bureau of Economic Research.

Wallace, N., 1981. A Modigliani-Miller theorem for open-market operations. *The American Economic Review*, *71*(3), pp.267-274.

Walsh, Carl E. 1998. Monetary theory and policy. Cambridge, Mass.: MIT Press.

Weale, M. and Wieladek, T., 2016. What are the macroeconomic effects of asset purchases?. *Journal of Monetary Economics*, *79*, pp.81-93.

Wright, J.H., 2012. What does monetary policy do to long-term interest rates at the zero lower bound?. *The Economic Journal*, *122*(564), pp.F447-F466.

VII. Appendix

1.Variables summary.

Index Considered	Country	Firms in Sample
dax	Germany	299
cac	France	340
atx	Austria	44
ibex	Spain	144
ftsemib	Italy	170
aex	Netherlands	128
psi20	Portugal	24
bel20-	Belgium	78
cyprus 20	Cyprus	11
HEX fin	Finland	108
ASE	Greece	40
ISEQ ireland	Ireland	70
omx riga	Latvia	8
omx v	Lithunia	14
luxxx	Luxembourg	32
sbitop	Slovenia	6
slovakia	Slovakia	5
maltex	Malta	4
talse ind	Estonia	8

The firms considered includes all the firms which are listed on the stock exchanges and are not a part of the financial stocks (Banks Insurers or Ams or Specialty Fin)

The Index considered is the largest blue chip index of each of the respective countries but all ratios are calculated after removing financial stocks from the index. This was done via bloomberg.

A. Stock Issuance by Country (Q12005-Q12016):

	AU	BE	CY	ESP	EST	FIN	FR	GER
Mean	1,007.05	781.66	104.17	2,287.93	7.72	285.47	5,151.48	1,834.42
Std. Dev.	2,001.63	1,195.84	145.79	2,277.29	25.88	356.87	6,288.14	1,497.28
Min	0.00	13.03	0.00	0.00	0.00	0.00	681.34	167.00
Max	8,596.00	6,523.96	532.79	8,835.26	142.49	1,662.00	39,405.39	6,539.00
Obs.	45	45	45	45	45	45	45	45

	GR	IRE	ITL	LAT	LIT	LX	MAL	NL
Mean	223.24	514.87	891.17	5.47	9.35	477.55	18.94	1,722.38
Std. Dev.	821.81	562.49	1,892.77	24.22	23.58	846.39	49.64	2,077.17
Min	0.00	53.41	6.60	0.00	0.00	0.00	0.00	14.99
Max	5,448.00	2,406.54	11,648.60	142.49	102.66	4,057.78	214.16	11,038.96
Obs.	45	45	45	45	45	45	45	45

	POR	SLOV	SVN
Mean	194.91	3.25	13.87
Std. Dev.	307.32	21.80	31.20
Min	0.00	0.00	0.00
Max	1,196.30	146.23	160.55
Obs.	**45**	**45**	**45**

Table 6. Stock Issuance Statistics

B. Corporate Bond Issuance (Q12005-Q12016):

	AU	BE	CY	ESP	EST	FIN	FR	GER
Mean	1,766.67	1,958.03	63.44	864.60	36.46	977.84	15,153.22	5,816.93
Std. Dev.	1,006.36	2,100.60	123.50	892.55	93.28	899.39	6,858.23	3,109.87
Min	272.00	130.54	0.00	0.00	0.00	0.00	4,144.00	503.00
Max	4,169.00	13,295.13	450.00	3,470.00	510.00	3,350.00	34,354.00	11,338.00
Obs.	45	45	45	45	45	45	45	45

	GR	IRE	ITL	LAT	LIT	LX	MAL	NL
Mean	822.15	601.10	3,536.82	5.38	0.25	1,027.84	13.19	2,786.58
Std. Dev.	774.16	1,135.39	2,581.58	15.11	1.32	1,510.84	23.43	1,959.96
Min	0.00	0.00	195.62	0.00	0.00	0.00	0.00	0.00
Max	4,221.86	5,406.84	10,283.08	75.00	8.82	6,032.38	85.00	8,777.40
Obs.	45	45	45	45	45	45	45	45

	POR	SLOV	SVN
Mean	927.33	96.43	32.71
Std. Dev.	845.67	309.58	66.41
Min	65.00	2.92	0.00
Max	4,241.40	1,996.10	326.50
Obs.	**45**	**45**	**45**

Table 7. Corporate Bond Issuance Statistics

C. ECB Loans provided by Country (Q12005-Q12016):

	AU	BE	CY	ESP	EST	FIN	FR	GER
Mean	15,150.47	34,309.07	7,324.83	137,496.70	648.31	21,262.00	123,696.60	467,014.80
Std. Dev.	6,471.23	24,738.21	4,156.89	97,061.75	901.29	22,574.17	64,973.73	164,066.80
Min	6,495.00	7,856.00	1,583.05	47,745.00	-	1,298.00	32,437.00	213,266.00
Max	41,695.00	129,237.00	15,127.00	415,718.00	3,370.00	77,555.00	252,868.00	838,419.00
Obs.	45	45	45	45	45	45	45	45

	GR	IRE	ITL	LAT	LIT	LX	MAL	NL
Mean	70,146.00	60,106.24	134,606.50	86.13	71.09	6,366.13	571.80	59,259.09
Std. Dev.	46,489.81	42,110.64	83,692.04	217.38	205.78	4,851.73	511.51	42,250.59
Min	10,183.00	10,970.00	39,927.00	0.00	0.00	666.00	0.00	7,433.00
Max	145,142.00	133,246.00	292,387.00	1204.00	827.00	19,668.00	1649.00	184,915.00
Obs.	45	45	45	45	45	45	45	45

	POR	SLOV	SVN
Mean	26,424.13	1,842.60	2,003.71
Std. Dev.	19,845.97	2,238.66	1,554.94
Min	1,827.00	-	-
Max	61,965.00	8,540.00	4,384.00
Obs.	**45**	**45**	**45**

Table 8. ECB Loans provided by country statistics

D. ECB Debt Securities Purchased by Country (Q12005-Q12016):

	AU	BE	CY	ESP	EST	FIN	FR	GER
Mean	14,054.13	17,666.00	2,018.91	82,577.58	317.62	9,638.69	112,831.00	49,015.80
Std. Dev.	6,903.10	8,876.85	770.20	25,325.62	406.00	4,583.10	73,772.23	50,875.76
Min	5,169.00	4,450.00	765.00	33,981.00	-	704.00	6,500.00	2,649.00
Max	32,830.00	43,745.00	3,343.00	157,204.00	1,601.00	22,687.00	306,819.00	230,702.00
Obs.	45	45	45	45	45	45	45	45

	GR	IRE	ITL	LAT	LIT	LX	MAL	NL
Mean	20,772.78	25,763.51	131,467.20	495.00	279.04	3,472.40	1,238.67	23,649.62
Std. Dev.	5,584.93	22,217.89	56,474.53	1,095.57	847.78	634.39	860.72	12,675.28
Min	11,884.00	4,169.00	66,043.00	-	-	1,836.00	-	8,742.00
Max	32,989.00	63,998.00	298,171.00	4,447.00	3,676.00	4,543.00	2,389.03	66,526.00
Obs.	45	45	45	45	45	45	45	45

	POR	SLOV	SVN
Mean	17,558.93	6,122.99	2,721.76
Std. Dev.	7,766.65	4,825.59	1,462.91
Min	6,773.00	-	-
Max	39,525.00	12,655.50	6,063.31
Obs.	**45**	**45**	**45**

Table 9.ECB debt securities issued by country statistics

2. Panel Diagnostics:

A. Correlation between variables

	StockIssuance	BondIssuance	Sub_loans	QEProxyLoansbyCountry	QE_proxy2_DebtSecuritiesbyCountr	Eurozone_Debt_outstanding	domesticcreditoutstanding * hence these two variables are not used together	GDP	Domesticcredpgdp	loans2Deposits_mfis_country	CostofBorrowing	VIX	UStreasuriesheldbyFED_Millio	ecb_policy_unc	P_ecb_Uncen	eco_sentiment	GDP_forecast	Financial_transactions_net	Industrial_Prod	Stock_Index_P	Return_StockInd	Abs_Ret_Vol_	Price_Book_R	Net_Debt_Share	Uk_QE	Euri_Bor_3	ECB_Main_Ref	Both_Fin_Crisis_Dummy	ASSET_PURCHASE_PROGRAM
StockIssuance	1																												
BondIssuance	0.5109	1																											
Sub_loans	0.8436	0.4701	1																										
QEProxyLoansbyCountry	0.218	0.4342	0.3534	1																									
QE_proxy2_DebtSecuritiesbyCountr	0.339	0.5849	0.3245	0.5135	1																								
Eurozone_Debt_outstanding	-0.0809	0.0461	-0.0248	0.0997	0.0699	1																							
domesticcreditoutstanding	0.417	0.5952	0.4587	0.6943	0.7809	0.0319	1																						
GDP	0.4215	0.6715	0.4991	0.8139	0.6858	-0.0167	0.9257	1																					
Domesticcredpgdp	-0.0093	-0.1016	-0.0403	-0.0286	0.0725	0.1992	0.1044	-0.0606	1																				
loans2Deposits_mfis_country	-0.0166	-0.1129	-0.0032	0.0387	0.0788	0.136	0.165	0.0258	0.3904	1																			
CostofBorrowing	-0.198	-0.2811	-0.1872	-0.1704	-0.2898	0.0758	-0.2007	-0.2347	0.3411	0.1725	1																		
VIX	-0.074	-0.0146	-0.0419	0.012	-0.0212	0.6086	0.0274	-0.0097	0.1186	0.1345	0.2383	1																	
UStreasuriesheldbyFED_Millio	0.0601	0.0716	0.0425	0.1191	0.2574	-0.0283	-0.0133	0.018	-0.0312	-0.1717	-0.4749	-0.3122	1																
ecb_policy_unc	-0.0564	0.0235	-0.0398	0.1602	0.2007	0.4403	0.0146	0.007	0.0846	-0.0248	-0.2881	0.2016	0.544	1															
P_ecb_Uncen	-0.046	-0.0605	-0.019	-0.0133	0.0157	0.0206	0.0013	-0.0026	0.006	0.0074	-0.0075	0.1769	0.007	0.4367	1														
eco_sentiment	-0.0006	-0.0406	-0.0048	-0.0733	-0.0101	-0.4431	0.0156	0.065	-0.2717	-0.1639	-0.0236	-0.397	0.0474	-0.2293	0.0716	1													
GDP_forecast	-0.0771	-0.1253	-0.1071	-0.1669	-0.1486	-0.3551	-0.167	-0.1228	-0.2946	-0.1698	0.0723	-0.1572	-0.0553	-0.1449	0.0557	0.6067	1												
Financial_transactions_net	0.0584	0.1177	0.0307	-0.0368	0.0399	-0.1836	0.2376	0.2359	0.0058	0.1054	0.1073	-0.0409	-0.241	-0.2651	0.0082	0.2099	0.1572	1											
Industrial_Prod	-0.034	-0.0452	-0.0338	-0.0785	-0.0416	-0.1025	0.0008	0.0218	-0.2451	-0.0431	-0.0775	-0.071	0.0318	-0.0573	0.0314	0.3359	0.3431	0.3108	1										
Stock_Index_P	0.1046	0.1313	0.1696	0.272	0.5298	-0.1343	0.5988	0.4829	0.1128	0.2461	-0.0112	-0.0785	-0.0814	-0.1472	-0.0009	0.1085	-0.0729	0.2996	0.1214	1									
Return_StockInd	0.0627	0.0597	0.0701	0.0221	-0.0003	-0.2855	0.0135	0.0366	-0.1778	-0.0574	-0.3018	-0.5197	0.0733	-0.2401	-0.2318	0.1157	-0.1022	-0.046	0.0142	0.0434	1								
Abs_Ret_Vol_	-0.0595	-0.0591	-0.0255	-0.0501	-0.1367	0.3186	-0.1068	-0.1258	0.3151	0.1155	0.3276	0.3687	-0.3049	-0.1074	-0.0734	-0.4297	-0.3034	-0.0625	-0.2029	-0.1281	-0.1381	1							
Price_Book_R	0.1312	0.1145	0.096	-0.0094	-0.0014	-0.532	0.1061	0.1406	-0.1626	0.1879	0.1122	-0.2656	-0.3422	-0.5208	0.0109	0.4276	0.3726	0.3479	0.2632	0.2467	0.1907	-0.2031	1						
Net_Debt_Share	0.1013	0.139	0.1557	0.2407	0.5821	0.0196	0.6309	0.4429	0.1994	0.2289	0.0381	0.0503	-0.1127	-0.0499	-0.0019	-0.0811	-0.1706	0.1719	-0.0152	0.8412	-0.0449	-0.0385	0.0381	1					
Uk_QE	-0.0115	-0.0194	-0.0122	0.0064	0.0044	0.2118	0.0006	-0.0095	0.0523	0.0258	0.0609	-0.1521	0.0945	0.2174	0.1353	0.1678	0.0621	-0.0385	0.0597	0.0002	0.0382	-0.1931	-0.0503	-0.0064	1				
Euri_Bor_3	-0.0403	-0.1097	-0.06	-0.1374	-0.226	-0.1245	-0.0004	-0.0115	-0.0393	0.1172	0.6321	0.1903	-0.7234	-0.5332	0.0353	0.283	0.387	0.3749	0.1921	0.1435	-0.2145	0.0723	0.5247	0.0952	0.0472	1			
ECB_Main_Ref	0.0116	-0.1158	-0.031	-0.1399	-0.1364	-0.5657	-0.0171	0.004	-0.1323	-0.0137	0.279	-0.2511	-0.2742	-0.4075	0.1872	0.5512	0.4574	0.3381	0.2425	0.1631	0.0229	-0.2932	0.5844	0.0378	0.0151	0.6592	1		
Both_Fin_Crisis_Dummy	-0.1106	-0.0197	-0.0568	0.0064	-0.0282	0.6143	0.0301	-0.01	0.1419	0.1424	0.1321	0.5783	-0.3497	0.1706	0.0205	-0.223	-0.082	-0.0427	-0.0808	-0.0832	-0.359	0.2627	-0.2949	0.0525	0.0317	0.0841	-0.2659	1	
ASSET_PURCHASE_PROGRAM	0.004	0.0968	0.0421	0.1485	0.2279	0.4471	0.0098	0.0055	0.0952	-0.0618	-0.5329	-0.076	0.68	0.6412	0.0013	-0.2666	-0.4353	-0.3709	-0.1523	-0.1536	0.1495	-0.0662	-0.6048	-0.0791	0.1643	-0.8808	-0.6244	0.105	1

Table: 10. Correlation table for variables

B. Hausman Tests:

Bond Issuance. The test shows that there is significant between and within variation in each of the constituents therefore a random effects model is better than a fixed effects model.

```
Breusch and Pagan Lagrangian multiplier test for random effects

        BondIssuance[Countryid,t] = Xb + u[Countryid] + e[Countryid,t]

        Estimated results:
                             |       Var      sd = sqrt(Var)
                             |
                    BondIss~e|    1.60e+07        4002.093
                           e |     3555889        1885.706
                           u |     3947102        1986.731

        Test:   Var(u) = 0
                                chibar2(01) =   3808.58
                              Prob > chibar2 =    0.0000
```

Table: 11. Hausman test Bond Issuance Specification

Stock Issuance proxied by Price to Book: Since the initial equation uses a IV estimation technique and Price to Book ratio is used in the first step. The instrumented Price Book ratio is utilized in the second step equation to see the impact upon the Stock Issuance. I have conducted the hausman test on the price to book ratio to show that a random effects model is necessary as there is significant variation within and between individuals.

```
        Price_Book_R[Countryid,t] = Xb + u[Countryid] + e[Countryid,t]

        Estimated results:
                             |       Var      sd = sqrt(Var)
                             |
                  Price_B-R  |    .4929386        .7020959
                           e |    .2059398        .4538059
                           u |     .087564        .2959121

        Test:   Var(u) = 0
                                chibar2(01) =   2267.01
                              Prob > chibar2 =    0.0000
```

Table: 12. Hausman test Stock Issuance Specification

3. QQ plots and residuals for both the tests

A. Bond Issuance Main Benchmark Specification:

Given below are the residual plots for the bond issuance specification (1) and the consequent normal plot alongside it. We observe a slight skew although there is most of the residuals observing the normality condition. We also show the QQ plot for the regression residuals where we can observe that the residuals only show slight deviation from the normal plots however the impact of the outliers is mitigated after robust standard errors.

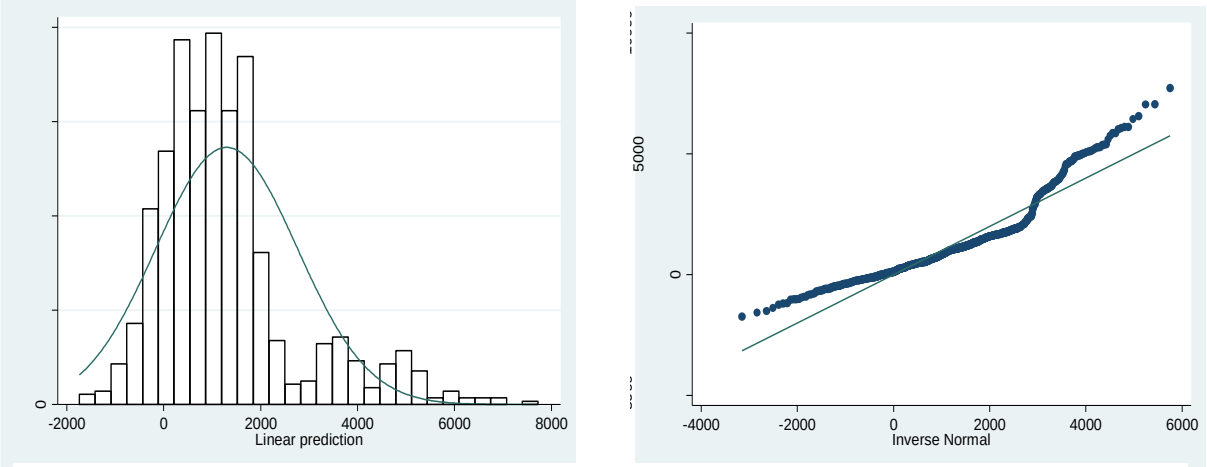


Figure 6. Residual plots vs Normal (LHS) QQ plots vs Normal (RHS) for Bond Issuance

B. Stock Issuance Main Benchmark Specification:

Given below are the residual plots for the Stock Issuance specification. Here we can observe that the residuals are largely normal especially since we are using IV estimators and robust standard errors. The QQ plots also show that the residuals are largely following the normal trend.

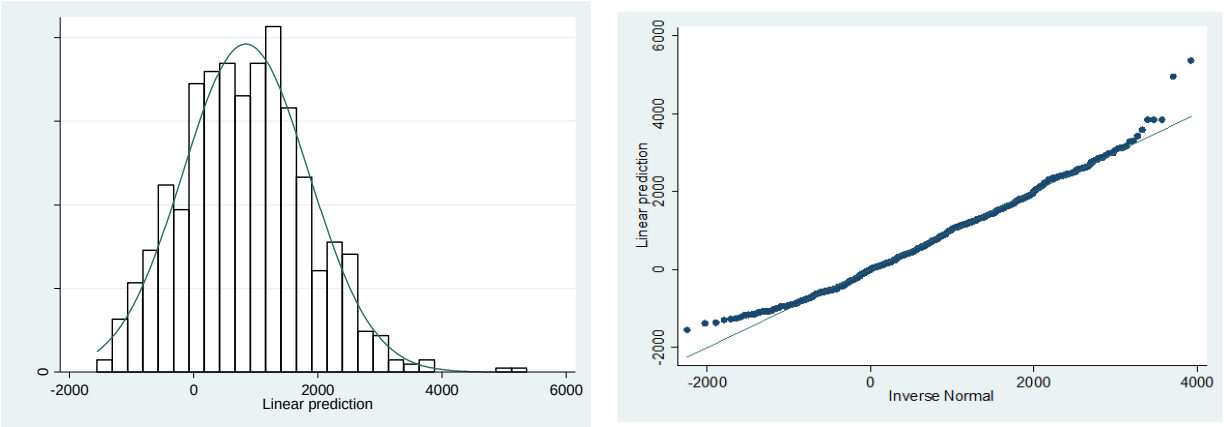


Figure 7. Residual plots vs Normal (LHS) QQ plots vs Normal (RHS) for Stock Issuance

4. **Core vs Periphery tests**

Bond Issuance

	Core		Periphery		Alternate QE Measure
Independent Variables	**Alt Controls**	**With US and UK QE**	**Alt Controls2**	**With US and UK QE2**	**Transformation of Base**
QeProxydebtsecbycountry i,t	0.0199739***	0.01830***	0.019974***	0.0183037***	
QeProxyloansbycountry *i,t*	0.00532**	0.04102**	0.00532*	0.0047394*	
QeProxy debtsecbycountry i,t /total debt outstanding *i,t*					1094.89*
QeProxy loansbycountry i,t /total debt outstanding *i,t*					783.7939*
Loans to Deposits	7.1713*	8.05749*	7.17547	8.057492	10.03571**
Cost of Borrowing	(217.795)*	(90.67598)	(217.795)*	(90.67598)	(533.8034)**
VIX		(10.47756)		(10.47756)	(11.4767)
Stock Returns		897.534		897.534	357.768
Volatility Indicator		481.903		481.9033	1340.794*
ECB Ref Rate	(2036.31) **	(1872.713)***	(2036.31)**	(1872.713)***	(1812.686)***
GDP Forecast	(21.96763)		(21.9676)		
ECB Policy Uncertainty	(6.91456)***		(6.91459)		
Economic Sentiment					
Industrial Production					
FED Treasury Purchases		.00006		0.00006	
BOE Treasury Purchases		(.00542)		(0.00542)	
EU Asset Purchase Prog					
Core	3669.007***	4003.834***			
Periphery			(3669.007)	(40003.834)	
Constant	80.68638	(1433.876)	3749.971*	1845.967	1393.455

The models stated above all follow the equation (1) from the bond issuance section with changes in the model. However this part does not include bootstrapping.

The Models tested utilize a core proxy (dummy variable) for the core models and periphery proxy (dummy variable) for the periphery models.

In the alternate control variables we remove VIX, Stock Returns and Volatility indicator with Policy Uncertainity, GDP forecast

In the US and UK QE we use our benchmark model and include US and UK Qe variable proxies.

The Alternate QE measure changes our main independent variable and uses a transformation of both into a percentage of total debt outstanding for each of the econs.

The * , ** and *** denote significance on 10%, 5% and 1% levels for each of the variables. The models have all been tested with the same tests as before.

Table 13. Core Vs Periphery Measures alternative measures for the Bond Issuance Specification

Bond Issuance

Independent Variables	Benchmark	Model 1	Model 2	Model 3
QeProxy*debtsecbycountry i,t*	0.01760***	0.01731***	0.01979***	0.01735***
QeProxy*loansbycountry i,t*	0.004400***	0.04209*	0.05469*	0.00445*
Loans to Deposits	7.5813*	7.55469	6.352962	8.02708
Cost of Borrowing	(146.930)	(134.245)	(266.89)*	(125.661)
VIX	(9.3592)	(13.471)		(3.03232)
Stock Returns	809.637			852.015
Volatility Indicator	549.784			501.563
ECB Ref Rate	(1,788.43) ***	(1849.99)**	(1679.35)**	(1812.686)***
GDP Forecast		(25.6985)		
ECB Policy Uncertainty			(7.34792)**	
Economic Sentiment			(16.045)	
Industrial Production				
FED Treasury Purchases				0.00004
BOE Treasury Purchases				0.004884
Constant	226.236	412.436	3359.52	183.113

The models displayed are all bootstrapped with 1000 replications and clustered on the 19 countries. The idea is to depict that the Results are robust for a number of trials and appropriate controls for any hetroskedasticity and auto-corr are made. The benchmark stays the same as in the model presented in the results we did include the robust version of the model. The left hand side lists the independent variables for the Bond Issuance equation. The equation utilized is equation (1) and the transformations are as follows: In model 1 we removed the stock and volatility of stocks factor and add gdp forecasts to proxy for changes in sentiments and eco Scenario. In model 2 we add the Ecb policy uncertainty and economic sentiment indicators instead of VIX and Stock related factors In model 3 we add the US FED and BOE QE measures to our benchmark model in order to see the impact of these variables upon bond issuance. The *, ** and *** indicate levels of significance at 10%, 5% and 1% levels respectively.

Table 14. Bootstrapping and Other tests for Bond Issuance

6. Instruments Testing and Alternative Forms of Stock Issuance specification.

Tests for Instruments:

A. Test for validity of the instruments:

I first conducted a panel random effects regression with robust standard errors to confirm each of our chosen instruments. The results are presented below. As observable from the table all of the chosen instruments are significant at the 1% level with our endogenous variable

Dependend Variables		Price Book Ratio
Independent Variables	Variable type	OLS Random Effects for Strength of Instruments
$\frac{QeProx\, y_{DebtSecByCountry}}{Debt\_Outstanding}$	Instrument	0.82261**
$\frac{QeProx\, y_{LoansByCountry}}{Debt\_Outstanding}$	Instrument	0.51329**
Price to Book Ratio	Endogenous	-
Net Debt Share	Independent	-
Financial Market Maturity	Instrument	0.0000185***
Stock Returns	Instrument	1.27650***
GDP Forecast	Instrument	0.09267***
Constant		1.55974*

Table 15. Validity Tests for Instruments

B. Test to check that errors are not correlated with the error terms:

I calculated the error terms for a regression between price to book ratio and stock issuance and then ran another regression using the error terms from that equation as the primary dependent and the instruments as the independent. As observable from the regression results below none of the instruments are correlated with the error terms.

Dependent: Errors (regression benchmark Stock vs P/B)	
Independent	
Net Debt per share	0.00362
Financial Market Maturity	-0.03461
Stock Returns	-131.721
GDP Forecast	27.005
$\frac{QeProx\, y_{DebtSecByCountry}}{Debt\_Outstanding}$	-131.146
$\frac{QeProx\, y_{LoansByCountry}}{Debt\_Outstanding}$	-137.603
Cons.	111.121
The equation first uses equation (2) from stock issuance and its errors are calculated which are regressed upon each of the instruments identified here.	

Table 16. Regression between instruments and error terms

C. Sargan Hansen Test for Overidentification:

The Sargan, J. D. (1958) test for overidentifying restrictions is a joint test for the validity of the included instruments and the invalidity of the excluded instruments. The null is that the instruments are valid and the excluded instruments are invalid. Our test statistic clearly accepts the null as the statistic is 0.138 Chi Sq.(1) which translates to a p value of 0.7105.

Test of overidentifying restrictions: Cross-section time-series model: xtivreg g2sls Sargan-Hansen statistic 0.138 Chi-sq(1) P-value = 0.7105

Table 17. Sargan Hansen Test for Overidentification

D. Alternative measures of Stock Issuance

Stock Issuance (2sgls regressions)

Dependend Variables		**Price Book Ratio**	**Stock Issuance**		
Independent Variables	Variable type	OLS Random Effects for Strength of Instruments	Panel I.V Baltagi Wu Method	Panel I.V with Core EU sample	Panel I.V with Periphery EU sample
$\frac{QeProx\ y_{DebtSecByCountry}}{Debt\_Outstanding}$	Instrument	0.82261**			
$\frac{QeProx\ y_{LoansByCountry}}{Debt\_Outstanding}$	Instrument	0.51329**			
Price to Book Ratio	Endogenous	-	2509.76*	2815.43*	260.43**
Net Debt Share	Independent	-	0.00614	(0.00506)	0.023449**
Financial Market Maturity	Instrument	0.0000185***	(0.05274)	(0.04157)	(0.17310)
Stock Returns	Instrument	1.27650***	(2218.680)	(1608.83)	(25.93683)
GDP Forecast	Instrument	0.09267***	(255.772)*	(521.479)*	(22.36352)*
Constant		1.55974*	(2336.05)	(1922.83)	(130.116)
The first equation is a random effects panel regression with robust standard errors in order to determine the strenght of the instruments. The dependent is P/B ratio and the regressors are the ump variables, the Net Debt per share, Financial market maturity, stock returns and gdp forecast. The other three are two stage least squares regressions 1) is with baltagi wu method 2) is with Core EU countries only and 3) with periphery sample					

Table 18. Instruments test and Other methods of regression for stock issuance specification